DOCUMENT RESUME

ED 374 351 CE 067 346

AUTHOR	Jenkins, Davis; And Others
TITLE	The Role of Standards, Assessment and Credentialing in Educating the High Performance Worker: Lessons from Denmark and Great Britain. A Report of the Standards Team of the Comparative Learning Teams Project.
INSTITUTION	Maryland Univ., College Park. Center for Learning and Competitiveness.; Pittsburgh Univ., Pa. Learning Research and Development Center.
SPONS AGENCY	German Marshall Fund of the United States, Washington, D.C.
PUB DATE	Jun 94
NOTE	123p.; For other reports in this series, see CE 067 343-347.
AVAILABLE FROM	Center for Learning and Competitiveness, School of Public Affairs, University of Maryland, College Park, MD 20742 ($5).
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Comparative Education; Developed Nations; *Educational Certificates; *Educational Quality; Education Work Relationship; Foreign Countries; *Job Training; Labor Force Development; Postsecondary Education; Secondary Education; *Standards; Student Certification; *Student Evaluation; *Vocational Education
IDENTIFIERS	Denmark; Great Britain

ABSTRACT

This report summarizes findings of a team of U.S. business, labor, and public policy representatives that visited Denmark and Great Britain in Fall 1993 to study innovations in the education and training of young people for work. An executive summary and introduction are followed by two main sections that present findings from the visits. Each section addresses the research questions that guided the study. For each question, the report summarizes the Danish approach, the British approach, and the lessons for the United States. The section on standards and credentials focuses on these questions: how standards for vocational education and training are set and updated; how standards shape what is taught; and what the role of standards is in promoting innovation in teaching. The section on assessment covers how the performance of learners is assessed and documented and how the quality of vocational education programs is monitored and improved. A conclusion extracts from these lessons elements of Danish and British vocational education that could be used in constructing in the United States a viable system for preparing young people to be high performance workers of the future: national standards for workplace skills, employer "buy-in" of standards development and training, national board to oversee the setting and quality control of standards, local assessment of student performance, external quality assurance, and training and support for teachers. Exhibits from the countries are appended. (YLB)

ED 374 351

The Role of Standards, Assessment and Credentialing in Educating the High Performance Worker: Lessons from Denmark and Great Britain

A joint project of the
Center for Learning and Competitiveness
and the
New Standards Project

Center for Learning and Competitiveness
School of Public Affairs
University of Maryland

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The Center for Learning and Competitiveness (CLC) works with American practitioners and policymakers to apply the lessons from international education and training systems to policy development and system design in the United States. Improving the level of workforce preparation is a crucial component to improving productivity levels, boosting economic competitiveness and raising living standards. By helping US policymakers and practitioners understand the best practices and current trends in other countries, CLC helps to ensure that American innovation builds on the experience of others and attempts to achieve outcomes of the highest international standard.

CLC's activities provide access to the people and materials that illuminate the critical principles and components of high quality education and training systems. The range of activities include arranging targeted study programs of international systems, undertaking strategic consultancies for organizations or government departments, leading conferences and seminars in the United States, and publishing reports highlighting best practice and innovative methods for system reform. As part of CLC international study programs, American participants meet with their international colleagues and counterparts to examine the components and configurations of well-integrated education and training systems. They gain new perspectives as well as gather specific tools and information that will directly strengthen practice in the United States.

A priority for CLC's work is the dissemination of findings from international investigations to the education and training community, business and union leaders, politicians, journalists and other opinion leaders in the United States. CLC also works directly with state governments and with leading policy organizations to ensure their reform strategies are shaped and influenced by the experience of quality systems in other countries.

Learning from the international experience has already played an important role in building consensus and developing key leadership for nation-wide development of school-to-work transition systems, and in providing technical assistance in the establishment of these systems. A focus on the performance of international education and training systems enables the United States to learn from other policy successes, to avoid reform paths that have been unsuccessful and to ensure that our innovation will place us at the forefront of international best practice.

CLC was founded in 1992 with a three year grant from the German Marshall Fund of the United States (GMF). CLC's Executive Director, Anne Heald, created GMF's acclaimed Program on Improving U.S. Competitiveness, and has ten years of experience in running influential exchanges between the United States and Europe. The distinguished Advisory Board to CLC consists of leaders from American political, business, government and union sectors. The work of CLC is also supported by other foundations, state and federal governments. Support is also provided by the University of Maryland's School of Public Affairs, where CLC is based.

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The Role of Standards, Assessment and Credentialing In Educating the High Performance Worker: Lessons from Denmark and Great Britain

A Report of the Standards Team of the Comparative Learning Teams Project

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June 1994

A joint project of the Center for Learning and Competitiveness and the New Standards Project

PREFACE

In February 1993, CLC brought together 25 leading experts from state and federal organizations as well as international leaders, to identify the most pressing questions and problems that confront policymakers and practitioners working to build school-to-work transition systems in the United States. The outcome of that meeting was a consensus that there were five areas in need of immediate in-depth attention:

- Building a System: Governance and Finance
- Developing Standards, Assessment and Credentialing
- Building Partnerships: The Role of Economic Actors
- Designing Quality Programs
- Providing Career Guidance

To address these issues, and with the generous financial support of the German Marshall Fund of the United States, CLC initiated its Comparative Learning Teams Project. CLC issued a request for proposal nationwide, and respondents were asked to select one of these areas as the focus for an international learning investigation, developing levels of inquiry in substantial detail and with specific outcomes for their trip. The capacity of teams to effectively disseminate their findings in a way that would positively impact on the development of school-to-work systems in the United States was a key selection criteria.

CLC awarded grants to five organizations in the school-to-work transition field who led, planned and supported a Comparative Learning Team. The grants enabled each team of at least nine people to visit two European sites where sophisticated school-to-work transition systems operate. Each comparative learning team participated in carefully planned 12 to 14 day working sessions in Germany, Denmark, the United Kingdom, Switzerland and Sweden, where they gained direct access to their foreign counterparts and first-hand exposure to European systems.

The members of the learning teams consisted of leading resource people and experts who are catalysts for change in their field at local, state and national levels. Whether they were from the private sector, non-profit organizations or government, team members sought answers to the key strategic issues facing the development of quality school-to-work transition systems in the United States. Hosts in Europe commented on the clear focus of comparative learning team investigations around the pressing lessons of importance to American policymakers. A conference held in January 1994 allowed comparative learning team participants to discuss and refine their reports and findings, and to compare observations about international practice.

Already, the work of the comparative learning teams has had an impact on system-building in the United States. Team members were able to build on their European experience when designing state systems under the guidelines of the new Federal School-to-Work Opportunities Act. Officials in the Departments of Labor and Education, working on school-to-work policies, were briefed by one team member about the comparative learning teams project and team members' observations of European systems. Participants have spoken at numerous conferences, and published comments in newspapers and newsletters. Key findings of the teams are guiding further policy work around key issues such as the engagement of industry in school-to-work programs and in the design of skill standards.

CLC is now pleased to publish the five reports of the comparative learning teams. Each report highlights what the specific team found in their field of investigation, and particularly highlights the implications for American policymakers of European experience. We believe that they will be of equal interest to those who have examined the European models for workforce development previously and those who are being introduced for the first time to international expertise in this field.

For over a decade, American policy leaders have looked to Europe for insight into how to move young people effectively from school to the workforce, while providing them with relevant and valuable skills. The impressive achievements of European systems triggered much enthusiasm in this country about the potential positive impact of reform here. Many supporters of school-to-work reform in the United States first became excited about the potential impact of reform by looking at international best practice and some of the most innovative models of school-to-work transition grew out of exploring European sites.

Now, with the passage of the school-to-work legislation, and with states actively attempting to build school-to-work transition systems that will provide widespread opportunities for young people, the international experience remains highly significant. Issues that challenge American policymakers in building systems, such as developing appropriate funding mechanisms, engaging industry partnership and ensuring relevant standards, have long been at the core of investigation in Europe. Reform in European systems in recent years reflects current thinking about the delivery of quality school-to-work opportunities.

These reports are timely and relevant for American policymakers who not only want to look at the achievements of quality European school-to-work systems, but to explore in more detail the elements that enabled such systems to achieve quality outcomes. As states and sites move to implement comprehensive reform in the United States under the auspices of the School-to-Work Opportunities Act, all five reports will provide valuable information and insight into the best international lessons.

In releasing these reports, CLC would like to thank the German Marshall Fund of the United States for their generous support of the comparative learning teams project. We want to express our thanks to the lead organizations for the project: The Austin Chamber of Commerce, the New Standards Project, The Council of Chief State School Officers, the National Alliance of Business and the Northwest Regional Educational Laboratory.

In particular, we would like to thank the leaders of the five teams who generated such quality learning programs for their teams and led the process of developing these significant reports. To Bob Glover, Davis Jenkins, Glenda Partee, Esther Schaeffer and Larry McClure, our sincere thanks for your dedication and commitment to this valuable learning process.

Anne Heald
Executive Director
The Center for Learning and Competitiveness

EXECUTIVE SUMMARY

The accompanying report details the findings of a team of Americans who visited Denmark and Great Britain for two weeks during the Fall of 1993 to study innovations in the education and training of young people for work. The team was organized by the New Standards Project and was sponsored by the Center for Learning and Competitiveness at the University of Maryland.

The New Standards team mission was to learn about the latest thinking and practice in selected European countries around the use of standards, assessments and credentials in preparing young people for work in a global economy. The team chose to study the efforts toward this end of Denmark and Great Britain because these countries are in the process of either revamping an established system of vocational education and training based on standards of competence and assessments of performance (as in the case of Denmark) or creating such a system from scratch (in the case of Great Britain). In both countries, there is widespread interest in how best to prepare young people for productive roles in "high performance workplaces," which reflect approaches to organizing and managing work appropriate for competing in a global economy. The focus of our study in Denmark and Great Britain was primarily on vocational education of young adults who have completed compulsory school, which in both countries ends at age 16 or 17, and have either just entered the workforce or are preparing to do so.

The team brought back from its travels a number of lessons that we believe are relevant to efforts to establish a viable system of school-to-work transition in the U.S. These are summarized in the following.

Lessons on the Role of Standards and Credentials

Establish a single body to oversee the setting of skill standards for all occupations and industries.

Both the Danish and the British recognize the importance of establishing national standards for vocational education in order to allow for comparability of programs and portability of credentials based on those standards. In both countries, there is a unitary structure through which such standards are set, thereby ensuring the consistency of standards across programs and industries. A key advantage of a centralized standard-setting structure is that it provides an accessible forum for business influence over the training system. In the U.S., the highly decentralized nature of the mechanisms through which standards and curricula for vocational education are developed makes it difficult for business to exercise any real control over the content or quality of vocational programs offered by schools and colleges.

Couch standards in terms of broad goals and frameworks; avoid detailed specifications and regulations. Empower those best positioned to affect learning -- teachers, trainers, administrators and students themselves -- to work out the details of how to meet the standards.

Both the Danish and the British have learned from experience that only if standards are defined in broad terms can a system of vocational education based on such standards have any hope of keeping up with the increasingly fast pace of change in the technology and practice of work. In the 1960s and 1970s, the Danes followed the approach of specifying skill standards for vocational education in encyclopedic detail. In the 1980s, they abandoned this approach, having found it to be too inflexible. The bodies that govern Danish vocational education have since taken the tack of "steering the system by broad targets and frameworks" rather than attempting to control it through detailed standards and regulations. The British have had even more recent experience with the deleterious effects of trying to control educational practice with standards specified in great detail.

The approach of using standards to steer rather than control also has a motivating effect on teachers. Teachers are able to use their professional knowledge in finding ways to meet the needs of individual learners. They are more likely to be committed to their work and to the system because their role as professionals is valued.

Understand that standards by themselves will not produce lasting, systemic reform.

Standards, by the very nature of the process through which they are set, are bound to lag behind the emerging practices and needs of business. It takes a great deal of time, even in the most flexible systems, to develop the consensus needed to establish or change a standard.

The Danish system shows that the standard-setting process in itself doesn't ensure the responsiveness of the training system to the needs of industry. The main source of innovation and responsiveness in the Danish system is the joint development of curricula at the local level by representatives from schools, businesses and labor groups who use the broad goals and standards set for the system to guide their work. This on-going collaboration and communication on the design and delivery of programs influences the continual refining and adaptation of system-wide standards to meet the changing needs of industry. To the Danes, the most appropriate use of standards is as signals of broad national goals that guide the process of innovation and as means of codifying and disseminating advances in practice.

Hence, it is not standards *per se*, but on-going communication in and among all levels of the system about what is expected from students that drives innovation and makes for flexibility in the system. Standards provide a common language and focus for this communication, but they can not substitute for it.

Begin by building a national consensus about the aims of vocational education.

In the setting of standards for vocational education, the Danes benefit from the active involvement of business and labor that is based on a partnership built up over the course of a century or more. Lacking a similar history of involvement in education by industry, the British have had to court employers aggressively to become involved in the development of its new system of standards and credentials for workplace-based training (the so-called "NVQs"). While these efforts have succeeded in encouraging widespread participation by industry in the

setting of standards, they have also led to some serious problems, including a proliferation of standards defined by the many industry-led bodies, many of which reflect narrowly-defined, and often low-skill, jobs rather than broad work roles. In hindsight, these problems might have been avoided had the British been more selective in specifying the groups or families of occupations and the levels of jobs for which standards should be set. Instead, they leapt into the process as though the goal was to set standards for virtually every occupation in the labor market, no matter how low-skill or outdated.

As support builds in the U.S. for the establishment of a system of vocational education and training based on industry skill standards, it would behoove us to learn from the British experience, which argues for taking a more strategic approach to the development of such a system. In particular, the first step should be to build a consensus, based on strategic analysis of industry needs and labor market trends, about the purposes the system is to achieve and about the methods appropriate to meeting those aims. Like the British, we in the U.S. face the challenge of finding a balance between the goals of mobilizing broad involvement in standard-setting by industry and generating standards that will truly contribute to workforce development.

Use the restructuring of companies around high performance management practices as a lever for encouraging employers to adopt skill standards for training and organizational development.

Active involvement by industry in setting standards for vocational education and training is essential if the programs designed according to these standards are to meet the needs of the economy for a skilled workforce.

An increasing number of companies in Denmark and Britain are seeing involvement in vocational education of young people and investment in the training of their own workers as key elements of a larger strategy for meeting the growing challenge of global competition. This larger strategy involves the through-going restructuring of operations around principles of management practice promulgated variously under the labels of "total quality management," "lean production," or "high performance management."

In Great Britain in particular, some companies are finding that skill standards are a useful tool in their efforts to become high performance workplaces. These companies are using skill standards to rethink what they expect of their workers and how they can train workers and organize work to enable them to meet these expectations. For national standards to be used effectively in this way, efforts must be made to ensure that they reflect the broad demands of high performance work -- the high skill, high-wage jobs of tomorrow -- rather than the narrower requirements of the jobs of yesterday.

This approach of setting standards high and then relying on industry, under the force of competition, to follow the lead of high performance organizations in using such standards to increase the skills of their employees (rather than simply using them to certify skills that would be learned on the job anyway) seems to us to be the only way to ensure that the process

of setting skill standards has a positive impact on the skills of the workforce and thus on economic development. The trade-off is that many companies and perhaps whole sectors that rely on low-skill, low-wage work will not take part. Still, this seems to be a trade-off worth making, since the setting of standards for low-skill work is likely to use up lots of energy without generating much value in the way of real learning.

Question the assumption that academic learning leads to superior transferability of skills and knowledge. Ensure that goals and standards for the system reflect a balance between theoretical and practical learning.

Both the Danish and the British are trying to promote the development of vocational programs that are occupationally-relevant and yet that allow for transferability of skills when the demands of jobs change. Neither has found the definitive answer about what makes for learning readily transferable to new and uncertain situations. Still, both are discovering -- informed by efforts to improve training and organizational learning by high performance companies -- that the answer lies in finding a better balance between theoretical and practical learning. This should cause us to question the assumption, inherent in the design of U.S. education at all levels, that academic learning leads to superior transferability of skills and knowledge.

In the best examples from Denmark and Great Britain, learning is organized according to projects designed to allow students to tackle practical problems in-depth and motivate them to investigate theoretical issues as needed to solve the problems at hand. Guiding the development of these programs are goals and standards for the respective systems that reflect a balance between theoretical and practical learning. Such a balance needs to be reflected in the standards if it is to be manifested in teaching and learning. The British GNVQs represent a possible model for achieving the kind of balance that ought to be reflected in standards for vocational education in the U.S. In the GNVQ approach, standards for broad enabling competencies or "core skills" are defined separately from standards for subject matter and technical knowledge and skills. At the same time, the GNVQ standards frameworks require that core skills be taught in conjunction with subject area content, thus encouraging the integration of applied learning with learning of theory.

Rely on standards for what students should be able to do, rather than directives of how teachers should teach, to drive innovation in teaching.

The experimentation with methods of teaching that we witnessed in both Denmark and Great Britain has been catalyzed not by new directives on teaching, but by changes in goals and standards for student learning. For example, Danish teachers are grappling with ways to achieve the goal, set forth in the recent reform, of making the education of students more "holistic." Scottish educators are finding innovative ways to enable students to achieve the outcomes specified in the National Certificate modules.

Both countries are finding that competency-based standards -- that is, standards defined in terms of what students should be able to do -- tend to promote instruction that is interdisciplinary and project-based. So, for example, in the Scottish further education colleges, the use in teaching of long-term projects that encompass a range of National Certificate outcomes is on the rise. The required integration of core skills units with vocational units in the GNVQ framework seems likely to encourage use of interdisciplinary teaching in vocational education in England and Wales.

In both Denmark and Britain, in contrast to the U.S., there is a strong tradition of teachers as professionals qualified to decide how best to enable students to achieve standards of competence. As part of the on-going reforms in these countries, some excellent guidance materials have been produced by government agencies and awarding bodies. But, in general, the strategy has been to let schools and teachers in particular figure out how to achieve the goals themselves, on the principle that the many problems that will arise are best worked out "in the field," rather than in a central office.

Lessons on the Role of Assessment

Resist an over-reliance on "end of course" and other on-demand testing; advocate instead assessment that is embedded in the teaching and learning process.

In both Denmark and Great Britain we heard powerful testimony from teachers, workplace instructors and students about the pitfalls of excessive use of on-demand testing. The prevailing view among vocational educators in these countries is that constantly testing students to see how much material they have "absorbed" discourages students from taking responsibility for learning. The result is that students educated in such a way are ill-prepared to handle the many new and uncertain problems and situations they will confront in work and life outside of school. On-demand tests that are set by government agencies and other external bodies are even more disruptive to learning because they reflect a distrust in the judgment of teachers.

In contrast, assessment that is an on-going part of the learning process encourages students to take responsibility for learning and gives more authority to make judgments to those who are best positioned to evaluate a student's progress: his or her teachers, workplace mentors and fellow students.

The principle of giving responsibility for assessment to students and their teachers as a means of motivating learning was reflected in the management practices of the high performance companies we visited in Denmark and Britain, where great emphasis is being placed on giving responsibility for measuring and ensuring the quality of products and services to all employees, including those on the front lines of production or service. Companies such as these are relying increasingly on self- and peer-assessment of quality and performance by the workers themselves. It only makes sense that an education system that aims to prepare young people

for employment in high performance (and therefore higher wage) companies such as these should apply to its *modus operandi* the fundamental principles that underlie practice in such workplaces.

A related thrust of the on-going vocational education reforms of Denmark and Great Britain is the push toward the use of methods that embed assessment in the teaching and learning process. There was a general consensus among members of the team that a student log, like the ones used to monitor progress by Danish apprentices as they move back and forth between stints in school and in the workplace, is a powerful tool for assessment and learning. As is the practice in the British NVQ and GNVQ systems, such a log could be a key part of a "portfolio of evidence" that every student would keep to document what they have achieved and what more they need to do to meet the standards. The team was very enthusiastic about the portfolio of evidence concept, in part because it places responsibility for evaluating learning and growth on the learner, with the teacher or mentor serving as coach and guide.

Encourage schools to involve members of the community in assessing students.

Schools and colleges in the U.S. should follow the lead of their counterparts in Denmark and Great Britain by involving community members in assessing student work and thus taking advantage of the expertise and interest of members of their local communities. This would make especially good sense when the work to be judged involves a long-term project -- for example, a capstone piece of work by older students -- or portfolios of students' accomplishments over time.

This practice has a number of benefits. The presence of outside judges encourages students to do well and gives teachers an incentive to ensure that their students excel. If well run, the experience is more than just an assessment, providing opportunities for learning by student and teacher alike. As in the final examination of the Danish apprentice, outside judges help students to gain insight into their work by asking questions that encourage students to reflect on how they accomplished what they did, what problems they encountered and what they learned from the process. Teachers benefit by getting a sense of the standards against which outsiders judge their students. This practice also provides a more direct way for employers and other community members to contribute to student learning than is the case in most school-community partnership programs operating in the U.S. today.

Provide training and support to help teachers learn new methods of assessment; but don't expect quick results.

In 1983, the Scottish Action Plan set forth a bold vision of a system of assessment for vocational education based not on external exams, but on assessments developed locally by the teacher or trainer who would provide the instruction, assessments that ideally would be embedded in the everyday process of teaching and learning. Ten years later, the Scots have accomplished a great deal, but they still have a long way to go before there is a level of comfort with this approach throughout the Scottish vocational education system. While there

has undoubtedly been resistance among teachers and trainers to the new ways of thinking about assessment reflected in this approach, the main reason that these innovations have been so slow to diffuse is the magnitude of the changes they require in teaching.

Heeding this lesson from the vanguard work in Scotland, the Scottish and the British are generally taking steps to help teachers make the changes in teaching necessary to accommodate new approaches to assessment. Still, the British are coming to realize that training in assessment procedures is not enough -- that to come to a true understanding of the expectations set for students by standards and to make reliable judgments of student performance against such standards, teachers need to be able to examine and discuss with other teachers actual samples of student work. This discussion of student work needs to be incorporated as an integral part not just of teacher training, but of the everyday practice of teaching. The British are experimenting with ways of doing this through procedures for "verification" or auditing by schools and colleges of the results of assessments carried out under their auspices.

Allow teachers to have opportunities for professional development that help them gain a clearer understanding of what students need to be able to do to succeed.

Having clearly stated standards of what students should be able to do to prepare for productive roles at work is a critical first step to enabling teachers to make reliable assessments of their students. Teachers in the vocational education systems of Denmark and Britain have clear standards to guide them in making assessments. Teachers in the U.S do not. They rely instead on indirect and often vague signals about what is expected of students from textbooks, standardized tests, and packaged curricula.

However, for teachers to really understand what is expected of students in the world of work outside of school, they need to have on-going exposure and contact with that world. One way to help teachers stay abreast of new developments in the work world generally is to involve professionals from outside the schools in related disciplines and fields in assessing their students' work. Teachers would also benefit from working directly in fields related to their areas of teaching through internships and sabbaticals. The "practical teachers" in the Danish vocational education system spend an average of one week each year working in industry jobs in their fields. The British are investing considerable sums to create similar opportunities for all teachers, including teachers of academic subjects.

Don't let the drive for accountability overwhelm learning.

The mechanism by which the Danes ensure the quality of vocational education is a continual communication among parties at all levels of the system focused on improving the system's capacity to turn out skilled workers. The Danes do not rely on external examinations to determine how well the system is doing toward this end. Such examinations have little to offer in the way of useful information about the performance of students generally, especially

compared to the judgments of teachers in school and mentors in the workplace who observe the student's work daily over a considerable period and who themselves have a clear understanding of the standards.

The architects of the vocational qualification systems under development in Great Britain have also chosen, at least thus far, to resist using external examinations as a means of ensuring system quality. They see such tests as incompatible with the basic philosophy and structure of the systems they are creating, where authority for deciding how to meet the broad goals embodied in national standards is given to those at the local level where instruction and learning take place. This decentralization of control is believed to be critical for allowing the kind of flexibility and innovation characteristic of Danish vocational education and other world-class systems of workforce preparation.

In the U.S., external tests are still seen as the most effective way of ensuring that students and schools are performing up to expectations. If anything, pressure for external testing has increased in recent years from politicians and members of the public eager to "hold the schools accountable."

If the goal of education is to enable students to take responsibility for learning, the system must practice what it preaches. A key lesson from our study of vocational education in Denmark and Great Britain is that we cannot hope to encourage students to take responsibility for learning if we are constantly giving them tests to see how much they are learning. And we can't expect teachers and other educators to take initiative to find ways of improving student learning if we are constantly looking over their shoulders.

Consider an approach to ensuring system quality based on the best of the British verification system model.

The scheme of internal and external verification that is being developed as the main quality assurance mechanism in the emerging British vocational qualification systems has much to offer a model of vocational education in the U.S., we believe. The model is *not* that of the certification by professional associations characteristic of fields such as health care in the U.S., or that of the institutional accrediting bodies familiar to U.S. higher education. The standards typically used for accrediting educational programs in these and other quality control systems common in the U.S. are based typically not on measures of outcomes of student learning but instead on institutional characteristics that serve as proxies for the quality of teaching and thus of learning, such as credentials of the faculty, number of books in the library, duration of the course, course structure, content, etc. An army of part-time accreditors is employed to ensure that institutions meet these criteria, which bear a weak relationship to quality student outcomes.

In the model suggested by the British approach, quality control is focused on outcomes of student learning, and in particular on the evidence by which outcomes are assessed. This gives teachers and others at the level closest to the student broad flexibility and authority to decide how to help students meet the standards. This sort of flexibility is constrained by accreditation

systems common to the U.S., which focus on inputs and content of instruction. One member of our team warned that, "The minute we in the U.S. start to say, 'make sure that they are also teaching such and such, and make sure that they do things this way,' that is when we start to get into trouble."

To avoid the patronage and parochial interests that characterize certification and accreditation bodies in the U.S., a system of quality assurance for workforce education would ideally need to be coordinated by a single national body that transcends industry or professional affiliations. In Denmark, this is the role of the Coordinating Council for Vocational Education, which includes representatives from education, business, labor and government. In Great Britain, such a role is played by SCOTVEC for the Scottish vocational qualifications, and NCVQ for the U.K.-wide NVQ and GNVQ systems. Without such an umbrella organization in the U.S., it will be impossible to set national standards, let alone ensure that national standards are being met.

In Denmark and Great Britain, we saw the promise of a standards-based system of vocational education and training that is successful in preparing young people for work in a global economy. Where the systems of these countries work best, a critical factor is the involvement of employers, whether through the training of apprentices, contributing to the development of standards or curricula, or using standards to improve the skills and performance of incumbent workers. Employer involvement is no panacea. Employers do not speak with one voice and at times give conflicting messages, for example, by advocating that education should focus on "employability and adaptability," but then hiring the classically-trained, narrowly-proficient job candidate. As the final customer of workforce education and training, however, employers must play a central role in developing and sustaining a system of workforce preparation. Still, employer leadership should be cultivated in a way that facilitates communication and cooperation at every level of the system -- national, state and local -- between all stakeholders, including workers, educators and policy-makers. Our study of vocational education in Denmark and Great Britain has persuaded us that it is only on such a foundation of communication and cooperation that we in the U.S. can hope to build a system for preparing young people to be high performance workers of the future.

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INTRODUCTION

This report summarizes the findings of a team of Americans who visited Denmark and Great Britain during two weeks in the Fall of 1993 to study innovations in the education and training of young people for work. The team was organized by the New Standards Project, a partnership of states and school districts that are seeking to achieve dramatic improvements in U.S. education by setting clear, high standards for all students and by developing methods of assessment designed not only to measure but also to motivate student learning. The members of the team are listed in the Appendix. Each of these individuals is involved in initiatives seeking to enhance U.S. economic competitiveness by improving the education and training of Americans from the primary grades onward.

The New Standards team was one of several "learning teams" sponsored by the Center for Learning and Competitiveness of the University of Maryland. Each team received a grant from the Center to spend two weeks in European countries of its choice investigating a particular aspect of the approaches used in those countries to prepare young people for work. The purpose was to bring back models and lessons based on European experience that would help to further efforts in the U.S. to create a viable system for school-to-work transition.

The New Standards team chose to focus on the use by European countries of standards, assessment and credentials in preparing young people for work. In the U.S., there is widespread recognition of the need for a coherent system to prepare young people who do not go directly to four-year college out of high school for entry into the workforce. There is also a growing consensus that the strategy for creating such a system must include, first, high standards stated in terms of the competencies a young person needs to have to become a productive worker and, second, assessments of performance in relation to those standards that also promote learning.

The New Standards team chose to study Denmark and Great Britain because these countries are in the process of either revamping an established system of vocational education and training based on standards of competence and performance assessment (as in the case of Denmark) or creating such a system (as in Great Britain).

In Denmark, the main focus of our analysis was on the changes in what is called upper-secondary vocational education following a 1991 law calling for reform of the system. Of the ninety percent of Danish students who go on directly for further education following compulsory school (which ends at age 16), about two thirds enter vocational education, either in technical trades or in commercial fields. The other one-third goes to gymnasiums where they prepare for entrance to a university. Vocational education programs are organized according to alternating periods of training in school and in the workplace. Most programs last from three to five years. Standards for vocational education are set by trade committees, which are made up equally of representatives of industry associations and labor unions. These trade committees also play a central role in the governance of technical colleges where the in-school portion of vocational education takes place.

The 1991 reform called for changes in two main areas: instruction; and governance and finance. In the area of instruction, the reform sought to broaden vocational education to ensure that young people are prepared for a modern workplace characterized by increasingly rapid change and also have the flexibility to pursue further education and training beyond the upper secondary level. Business and labor, through the trade committees, sought to remedy the proliferation and over-specialization of technical education programs by consolidating the number of such programs from over 270 to under 90 and broadening the definition of the standards that guide instruction in these programs. The latter push especially stemmed from the recognition on the part of business and labor that no longer can a worker be guaranteed lifetime employment in a particular occupation. In advocating broader standards that stress the importance of "learning to learn" and adaptability, both business and labor sought to change workers' awareness of what it will take to succeed in the workplace of the future. The reform also required that "vocational education should be holistic," with the aim of encouraging instruction in school to be more like learning in the work world -- more interdisciplinary and applied -- so that students can learn how to deal with problems and situations like those they will encounter as workers. At the same time, the reformers sought to inject more academic rigor in vocational education by increasing the number of required academic courses and introducing an external examination of academic subject matter to be given at the end of the first year. Nevertheless, the reform preserved the basic structure of vocational programs, in particular the "sandwich model" with periods of training alternating between in-school and on-the-job.

In the area of governance and finance, the reform sought to increase the quality, efficiency and market responsiveness of vocational education. It advocated "steering by targets and frameworks" instead of "controlling by detailed regulations" as the best way to govern the system. It established the technical colleges as "self-governing" institutions with boards representing the college's main customers in the local community. At the same time, it moved the funding of the technical colleges to a system where money follows the student, thus increasing competition among the colleges.

In Great Britain, we focused on recent efforts to establish new systems of vocational credentials or "qualifications." One set of such qualifications, the *National Vocational Qualifications*, or *NVQs*, are nationally-recognized certifications of competence in specific occupations. They are designed to provide certification of skills acquired primarily on-the-job. Standards for NVQs are set by industry associations or "lead bodies." To receive an NVQ award, a candidate must assemble a "portfolio of evidence" demonstrating that he or she is competent in the skills specified by the standard. The candidate's supervisor reviews this evidence and relies on performance criteria included in the standards to assess whether or not the candidate has met a particular standard.

The British government launched the NVQs in 1986. In doing so, it had several motives. First, it sought to create a meaningful credential for young people involved in "Youth Training" programs, which offer subsidized employment and training to disadvantaged youth. These programs, which were heavily funded under the Labor governments of the 1970s, had been widely criticized for providing employers with publicly-subsidized youth labor and

offering young people little in the way of useful experience and training and no credential. Second, the government hoped to promote continual learning by experienced workers. Here the idea was that employers could use the national skill standards for particular occupations afforded by the NVQs to examine the kinds of skills they need in their employees and to rethink training and work organization appropriate to enabling employees to acquire these skills. Finally, the government sought to consolidate and revitalize existing skill certification systems, which were highly fragmented and, outside of a few craft occupations, were not held in high esteem. The government chose to offer NVQs through the awarding bodies of these existing certification systems, but at the same time established the National Council for Vocational Qualifications (NCVQ) to oversee and coordinate the work of these bodies.

Since the first NVQs came on line in 1988, a great deal of energy has been put into their development. As of December 1992, standards have been specified for over 80 percent of occupations in the British labor force. Thus far, over 350,000 have received an NVQ qualification, and an estimated one million workers are working toward one. Given that NVQs really only came on line in 1988, this represents a promising level of participation in a workforce of 23 million. Although still primarily used for youth training, NVQ awards are also now being pursued by an increasing number of adult workers as well.

The British are also in the process of developing another set of vocationally-oriented qualifications called the *General National Vocational Qualifications*, or *GNVQs*. The GNVQs provide a framework for school- and college-based vocational education of students in the 16-19 age group. Unlike the NVQs, the GNVQs are designed to prepare young people for entry into broad occupational streams, not to train them for specific jobs. GNVQ awards are therefore offered in a few broad categories that include manufacturing, leisure and tourism, and health and social care. Moreover, the GNVQ framework requires the integration into instruction in these occupational areas of "core skills," broad enabling skills such as communication, application of number, and use of technology that are intended to increase the breadth of learning in GNVQ programs.

Proposed by the British government in 1989, the idea for the GNVQs was advocated by the Confederation of British Industry, a group not unlike our Business Roundtable, in its influential 1990 report entitled "Toward a Skills Revolution." This report gave voice to a growing concern among leaders in British industry and government over a number of trends:

- Increasing enrollment in education beyond the compulsory age of 16, which has shot up from around 42 percent of the cohort in 1981 to 70 percent today (this includes enrollment in further education colleges -- the "British community college") -- the concern here is how to accommodate the growing numbers of young people seeking further education with programs suited to their interests and needs;

- Increasing disenchantment with the A-level system of university preparation as too academically-oriented and overly exclusionary;

- Recognition of the inadequacy of the NVQs for providing broad-based preparation needed by young people entering the workforce.

Because of the strong support for the idea, GNVQs were put on a very short development timetable. In 1991-92, GNVQs were piloted at 20 schools and further education colleges throughout Britain. Last year, the number of pilot sites was increased to 100. This year, 1993-94, GNVQs are being offered throughout England and Wales. Recently, the government announced that a GNVQ level 3 qualification will be equivalent to two A-levels, the minimum requirement for university entrance. Still, there is not wide-spread acceptance, especially among university circles, that this equivalence is valid.

Many of the features of the NVQs and GNVQs were pioneered in work on creating a new approach to vocational education in Scotland beginning in the early 1980s. In 1983, the *Scottish Action Plan* put forth a bold blueprint for a system of vocational education based on a number of key principles, including:

- Modularization of curriculum, to allow maximum flexibility in constructing programs to meet the students' needs;

- Learning outcomes stated in terms of standards of competence;

- Reliance on "internal assessment" by the teacher or instructor (as opposed to external assessment through standardized exams) based on performance criteria specified in the learning outcomes.

The Action Plan recommended rationalizing all existing vocational qualifications in Scotland under a single system of *National Certificate* modules based on these principles. In 1984, the *Scottish Vocational Education Council (SCOTVEC)* was established to serve as the single awarding body for the National Certificates. The development of National Certificate modules proceeded at a rapid pace. The first modules developed were designed primarily as a framework for vocational education for young people in the 16 to 18 age range through programs that would be offered primarily, though not exclusively, in further education colleges. Later, the Higher National Certificate and Higher National Diploma programs, postsecondary technical programs that had existed before the Action Plan, were converted to modular, competency-based format and put under the SCOTVEC bailiwick. Also, as NVQs have come on line, SCOTVEC has developed modules based on the standards developed for the NVQs by the U.K.-wide industry lead bodies. These Scottish equivalents of the NVQs are called, appropriately enough, SVQs -- Scottish Vocational Qualifications.

Underlying the reforms of vocational education in both Denmark and Great Britain is a search for better ways to educate young people to be productive and prosperous workers in a global economy. The main challenge is, given the increasing pace of change fueled by global economic competition, how to create a program of learning that will prepare young people for entry into specific occupations, yet give them the capacity to learn new skills and take on new roles as the demands of the workplace change.

The methods for meeting this challenge that these countries are exploring in their education systems mirror strategies being adopted by companies and other organizations throughout the industrialized world that are successfully responding to the rapid change wrought by global competition. These "high performance workplaces" are meeting the challenge of change by creating within their organizations a stable mechanism for continuous learning and innovation. A growing number of companies in Europe and throughout the world are achieving this by transforming their organizations according to international standards for management practice. ISO 9000, the standard for European companies, is increasingly being adopted by firms in the U.S.

For this reason, plus the fact that workplaces outside of school can add a rich dimension to vocational education, we decided to include in our itinerary visits to companies as well as to schools and community colleges.

In the remainder of this report, we present our findings from these visits. The findings are divided into two main sections: Standards and Credentials; and Assessment. Each section addresses the research questions that guided our study -- questions that confront the efforts each of us is involved in to improve education and training of Americans for work. For each question, we summarize the Danish approach, the British approach and the lessons for the U.S. In the conclusion, we extract from these lessons elements of Danish and British vocational education that we think could be used in constructing in the U.S. a viable system for preparing young people to be high performance workers of the future.

STANDARDS AND CREDENTIALS

1. How are standards for vocational education and training set and updated?

Main issues of interest to the team:

- What form do these standards take?;
- How to get industry involved in the setting of standards;
- How to ensure that standards keep pace with rapid changes in the technology and practice of work;
- How to encourage employers to use standards and credentials for vocational education in hiring new employees and in training incumbent employees.

DANISH APPROACH

A System Built on Cooperation

Standards for vocational education in Denmark are developed through close cooperation between the Ministry of Education, employer associations, labor unions and technical colleges. Exhibit 1 illustrates the structure of the system through which this cooperation takes place.

Together, business and labor have the greatest influence on the shape of Danish vocational education through joint representation on governing bodies at three levels:

Council for Vocational Education - Deals with the overall governance of the vocational education system, advising the Minister on matters such as the goals and structure of the system; approval of new trades, schools, and programs; teacher qualifications; and entry requirements. This Council is established by the Minister of Education, who appoints the chairman. Its membership is dominated by business and labor representatives, but includes representatives of the teachers' unions and technical colleges.

National Trade Committees - Made up of equal numbers of employer and labor representatives, these committees determine (subject to formal approval by the Ministry): the duration of training, required courses, objectives and general content of courses and assessments.

Local Education Committees - These local affiliates of the National Trade Committees advise the technical colleges on programs in their trade area and assist in finding placements for students in local firms. They are akin to the industry advisory groups set up by community and technical colleges in the U.S., but the extent of their

involvement is in general greater and they are better organized, with strong support from their national organizations.

The active involvement of business and labor as partners in setting standards for vocational education -- indeed the Danes refer to business and labor as "the partners" -- made a big impression our team, coming from the U.S., where cooperation between business and labor is uncommon and joint involvement in formal education is even rarer.

The influence of the partners over the system is not without checks and balances, however. For example, while the Ministry for Education defers to the authority of the partners to decide the substance of vocational programs, it is the Parliament that determines the level of funding for vocational education. This means that, in setting the standards for the system, the partners must take into account the level of resources available to achieve the aims reflected in the standards. This encourages a healthy dialogue between the partners and government which helps to ensure that resources are not indiscriminately spent.

What form do the standards take?

The form taken by the "standards" differs depending on which level of the system they originate from. From the Council for Vocational Education and Ministry of Education come broad directives about the structure of the system and goals to which it should aspire. The goals set at this level have an important influence on the direction of efforts at all levels of the system. For example, a key goal set forth in the 1991 law for the reform of vocational education was that "education should be holistic." As will be discussed below in the section on the impact of standards on teaching methods, there has since been a flurry of activity at the level of the trade committees and, perhaps even more so, in the technical colleges and company programs where instruction takes place, aimed at figuring out how to realize this goal in practice.

The "standards" developed by the national trade committees are really broad curriculum frameworks. Exhibit 2 contains excerpts from the framework for the field of mechanical engineering, which covers the specialties of machine tool fitter, plastics mechanic, ship's fitter, turner, cutter and bench worker. (Note that the part of the framework excerpted in the Exhibit 2 details the structure and content of those parts of the program that take place in school; the structure, content and objectives of the "practical training periods," which take place in firms, are outlined later in the document.) As is evident from these excerpts, the framework is quite specific about the structure, duration, and content of the educational program, going so far as to indicate which school subjects and technical skills should be taught in which period of the program. This and the other frameworks we were shown differ from "content standards" as they are generally thought of in the current standards-based reform movement in the U.S. in that they are much more specific about what should be taught.

However, a key feature of the Danish frameworks is that they also specify what the student should be able to do after having completed a given piece of the program (or the program as a whole). It is in this respect that the Danish approach to vocational education can be

considered competency-based. For example, page 2 of Exhibit 2 indicates that in the Second School Period, through instruction on the thermal joining of construction parts, "The student shall be able to carry out hard soldering in steel and copper materials." It is left to the technical colleges and companies to design the syllabi that detail what specifically students should learn in a particular course to enable them to achieve the outcomes specified in the framework. And, in keeping with the strong tradition of teacher authority or professionalism in Danish education generally, it is the responsibility of the teacher or trainer to decide what methods of teaching to use for this purpose. As we were told in the Ministry of Education, "Knowing how to reach the goals is what it means to be a teacher."

While the frameworks provide general guidance on the level or quality of student performance that is sufficient to meet the standard in a particular area of content, ultimately, it is left to the teacher or trainer to determine the standards of performance. The reliability of judgments made by teachers and mentors derives at least in part from their common status as skilled craftspeople. The hallmark of the skilled craftsman is the ability not only to apply the skills of the trade with an acceptable level of skill, but to recognize craftsmanship in others. When we asked a foreman at a company we visited in Copenhagen how he knew whether an apprentice has met a given standard, he simply said: "A skilled person knows when an apprentice has done a task well or badly." The reliability and validity of judgments made by teachers in the school are also enhanced by the on-going communication that takes place between teachers in school and mentors in the workplace.

While the teacher and mentor have broad authority to decide *how* to teach and *how well* the student needs to perform to meet the standard, the framework provides rather specific guidance on what the student should be learning at various points in the program. The document from which Exhibit 2 is taken is 45 type-written pages, and that only includes excerpts translated into English. We were told that the frameworks for Danish vocational training used to be specified in much more detail. According to Jørgen Andersen of the Danish Metalworkers Union, in the past the Danes defined standards using a job task analysis methodology that by Andersen's description sounded to us much like that used in the U.S. by the V-TECS Consortium and others. The Danes produced volumes containing these standards that were hundreds of pages long, not just tens of pages, as they are now. This approach was abandoned, Andersen says, because it could not keep pace with rapid changes in workplace technology. The move since has been toward frameworks specified in terms of more broadly stated student outcomes. The 1991 reform provided further impetus in this direction, by including as one of the chief goals, "to encourage steering of the system by targets and frameworks instead of detailed regulations."

How adaptable is the system?

The team was impressed by the level of cooperation among the various parties in the setting of the targets and frameworks for vocational education. Still, it seemed to us that, given the time it takes for parties with different interests to reach consensus, the system might not be able to respond to rapid changes.

What we discovered was that, while the national frameworks may lag behind the state-of-the-art of practice in industry and the schools, this is not considered to be a major problem. The reason is that they are as seen as setting a relatively high expectation of the *minimum* students should be able to do. Most students are expected to go well beyond the standards specified in the frameworks.

The fact that it is up to teachers and mentors to decide the specifics of what is taught and how it is taught means that the local level is the locus of innovation in the system. Perhaps the major source of innovation is the students themselves, in that they provide a communication link between school and workplace that allows both sides to stay abreast of changes in the other. Another source of innovation at the local level is the contract training courses that the technical colleges offer to local employers, which give the colleges a window on the latest technologies and techniques in industry. According to Jens Erik Simonsen, Head of Industrial Automation at Århus Technical College, "Most of the changes we are making in the basic vocational programs in Automatic Mechanics are coming mainly from what we are learning through the further education we offer companies." Erik Torp Nielsen, head of Århus Technical College's metalworking program sees the college's involvement in customized training for firms as vital to the quality of its apprenticeship programs. He believes that practical instructors who teach at institutions that are not engaged in training and R&D work for firms have a difficult time keeping up with advances in their field.

Communication seems to flow well from the local level up through the various levels of the system. The local trade committees are evidently effective in keeping their national organizations informed of developments in the field. The people we spoke with in the Ministry and national level partner bodies seemed to be very much in touch with what was going on at the local level. The standards serve as a common understanding that facilitates communication among the various levels of the system. Yet, it is not the standards that drive changes in the system, but rather the communication itself -- communication among people who understand the standards.

By the time an innovation is formally codified in one of the frameworks -- Exhibit 3 illustrates the process for an entire new program -- it has been tried out at the local level and has percolated up through the system. The codified standards serve as benchmarks that are used to "ratchet up" improvements in the system as new ideas are tested out and formalized as policy. Innovative programs in the colleges and certainly the training offered by most progressive companies will go beyond what the frameworks require in terms of what they expect students to be able to do. By the same token, the standards compel others -- particularly smaller companies -- to do more in their training than they otherwise would. So the effect is to keep the average level of practice in the system high.

There is still some concern among members of the team that while the speed with which changes to the frameworks are made within an industry may be good, the fact that the system is structured by trade committees may create walls between trades that make it difficult to create new programs in occupations that cut across families of trades. Nevertheless, the fact that under the recent reform, the number of occupational families for which there are separate

frameworks was reduced from some 270 to under 90, despite the turf battles and entrenched constituencies that had to be overcome, suggests that this is not an insurmountable problem for the Danish system.

High Level of Employer Involvement

In general, Danish employers need little encouragement to value the products of vocational education because they are so heavily invested in the system that these products are in a sense "their own." When representatives of Danish employer and employee associations we met with talked about the technical colleges, they referred to them as "our schools." This attitude may stem from the fact that the vocational education system is funded at least in part through corporate taxes that companies must pay whether or not they train apprentices. Employers therefore take pains to ensure that the technical colleges and the vocational system generally meet their needs by participating in the governance structure through which standards are set and on the boards of the technical colleges, and by providing training slots for apprentices in their workplaces.

This is not to say that there is universal support for vocational education among Danish employers. Not all firms train apprentices, and some companies, many of them small employers, have opposed the move toward higher standards and broader skill requirements, a trend accelerated by the 1991 reform. According to Jens Peter Jensen of Århus Technical College, these companies prefer more narrow training in skills relevant to particular jobs. "These companies think that they can do just fine without 'smart workers.' For this reason, some do not hire apprentices." Jensen and his colleagues at the college see as part of their mission educating employers like this about education and training appropriate for superior economic performance. Says Jensen, "The college is trying to tell these small business owners, 'If you are changing your products so often, then the skills required of your workers are also changing rapidly. So, you should be training your workers more broadly.'"

None of the companies we visited in Denmark needed this kind of lesson. Each is involved in the training of apprentices and is committed to vocational education as an effective means of maintaining the supply of skilled workers. Moreover, each is heavily invested in continual training of all of its employees, not just its skilled workers.

These companies see their human resources as the sole source of competitive advantage not only for themselves but for Danish industry generally. These are the companies that, along with labor unions seeking to improve the flexibility of workers to change jobs in a turbulent economy, are pushing for higher skill standards for education. To these companies and unions, there is really no viable alternative in a tiny country with no resources for economic development other than the talents and energies of its people. The fall of the Berlin Wall has strengthened resolve of Danish industry to pursue a high skill, high wage strategy of economic development. According to Jens Agerley of Radiometer, "Industry wants the government to set higher and higher standards for education and R&D since we can't compete on the basis of wages with Eastern Europe."

In every one of the firms we visited, investment in training and human resource development is a key part of a larger approach to management aimed at improving the quality of products, hastening the speed of innovation, and improving customer satisfaction. All had attained certification under ISO 9000, the international standard for total quality management. All were convinced that undertaking the sometimes dramatic restructuring required to meet the ISO 9000 standards was absolutely necessary if they hoped to have access to foreign markets, and certainly markets in Europe. Although we only visited a handful of firms in Denmark, we got the impression that the restructuring of Danish companies around ISO 9000 or total quality -- what in the U.S. is sometimes referred to as the move to "high performance work practices" -- is widespread among Danish companies. Given the strong reliance of the Danish economy on exports -- the manufacturers we visited shipped 90 percent or more of their products outside of Denmark -- this is likely to be the case, especially if such high performance practices are a pre-requisite to remaining competitive in international markets.

This trend toward greater investment in training as part of an overall move to high performance management is not confined to the largest companies. Indeed, commitment on the part of management, rather than size or resources, seems to be the key to making this transformation happen. One of the firms we visited, COTAS, a manufacturer of computer controllers for industrial processing machines that has only 45 employees, underwent a dramatic transformation after its owners/managers decided to go for ISO 9000 certification. Among the major changes at COTAS, according to Managing Director, Ole Riis Hansen, is in the area of training. Before ISO 9000, COTAS did not do much in the way of training for its employees; now every employee has a regularly-updated education plan, and "training of employees is going on all the time." Among the other things that COTAS now does differently under ISO 9000 are:

- Every worker is encouraged to get experience with every stage of production, in part to ensure that workers can fill in for each other, but even more to engender a broader understanding among all workers of the company's products and production methods.

- Every function is a unit that has control over the quality of its output. There is no more "double-checking" of workers' work, other than the final testing of each product.

- R&D (which involves nearly half of COTAS's 45 employees) is located on the production floor and production workers are consulted on the design of new products at each stage of the process.

The movement of Danish firms toward ISO 9000 and high performance work is starting to change the face of vocational education in Denmark. Certainly it is having an impact on the practical training of apprentices who have training placements in firms that are adopting high performance practices. At COTAS, apprentices are trained through rotation among operations at every stage of production, from design to manufacture and shipping. At Danfoss A/S, a maker of high quality metal valves, apprentices participate as members of teams that have

responsibility for the entire production line for a given product. At Radiometer, apprentices, like all employees, are expected to suggest ways to improve quality and efficiency.

We saw no evidence that these changes in the practical training of apprentices have yet been reflected in the frameworks that govern vocational training in specific trades. We suspect that it will only be a matter of time before this happens. One indication is that the philosophy of high performance management is becoming evident in the policy and governance of the vocational education system as a whole. Two of the major goals for vocational education promulgated by the 1991 reform clearly reflect fundamental principles of high performance management. First, the goal of steering by targets and frameworks instead of detailed regulations reflects the principle of creating constancy of purpose through broad goals that the members of an organization can believe in and work toward. Second, the goal of further decentralizing to the technical colleges control of the system reflects the principle of empowering those at the front lines of production or service to take responsibility for ensuring quality and making improvements to the system.

BRITISH APPROACH

Great Britain offers an opportunity to examine standard setting in a milieu more like the U.S. than Denmark in that there has not been a history of active involvement of business or labor in vocational education, outside of a few industries with a tradition of apprenticeship. Three different approaches to involving industry in the setting of standards are reflected in the National Vocational Qualifications (NVQs), the General National Vocational Qualifications (GNVQs) and the SCOTVEC National Certificate.

NVQs: Turning Standard-Setting Over to Industry

To encourage industry ownership of these occupation-specific qualifications, the government gave responsibility for setting and updating the NVQ standards to industry and professional associations called "lead bodies." Most of these lead bodies had been part of existing systems of training and certification, which the government sought to consolidate and revitalize under the single NVQ system.

Since the NVQs were launched in 1986, the government has provided funding to the lead bodies to define skill standards for occupations in their respective domains using a common methodology. A key principle of this methodology is to define competence from the top down in terms of the broad functions of a particular occupation rather than from the bottom up in terms of the myriad tasks a person carries out in the course of doing a job. The goal is to avoid the over-specification characteristic of traditional job task analysis.

This "functional analysis" methodology works as follows. Expert practitioners of a particular occupation are convened and asked to identify the broad purposes and key functions of their occupations. The key functions are defined as units of competence and are further broken out into elements of competence. An example of the "functional maps" that result from this process is given in Exhibit 4. For each element of competence, the focus group of

practitioners is asked to define performance criteria that describe behaviors indicative of competent performance of the particular element of competence and that could therefore be used by an assessor in judging whether someone is competent in the particular domain. Rounding out the definition of each element of competence are "range statements," which give a sense of the range of contexts or situations that a competent person should be able to handle, and "underpinning knowledge," which is the basic knowledge required for competent performance. Exhibit 5 shows the definition of a particular unit of competence for a baker.

The work of defining NVQ standards was slow to get off the ground in the three years following the introduction of the first NVQs in 1988. Part of this was due to resistance or at least indifference of employers to getting involved, but it also reflected a lack of experience of many of the lead bodies with the functional analysis methodology. In the last couple of years, the level of involvement and comfort among the lead bodies with standard-setting has grown considerably. Industries such as retail and hospitality, which had never done much in the way of training or certification, are now taking a leadership role. As of December 1992, standards had been specified for 80% of occupations in the British labor market. Thus far, over 350,000 have received an NVQ qualification, and projections are for over one million qualifications by 1995, with the number expected to increase exponentially thereafter.

Despite the recent spurt in NVQ activity, the setting of NVQ standards suffers from a number of shortcomings. One problem is that there is a fair amount of overlap in the standards being developed by different lead bodies. This is not surprising given that there is overlap among the lead bodies themselves. For example there are at least three lead bodies for engineering-related occupations.

A related problem is the proliferation of NVQ qualifications, each of them in a specific, and sometimes obscure, area of specialization. For example, there are three separate level two qualifications for "installing and commissioning telecommunications terminal equipment": "cellular," "fixed," and "radio." NVQs are being developed at five levels in each of a spectrum of occupational categories, which are listed in Exhibit 6 (the "NVQ Framework"). Note that higher NVQ "levels" are characterized by greater breadth and range of competence, ability to cope with non-routine activities, ability to organize and plan work, ability to assume responsibility and work without supervision, and ability to supervise others. The proliferation of standards has produced a prodigious amount of paper. For example, a thick three-ring binder is required to contain all the standards for "Staff Working with the Under Sevens and their Families" (i.e., day care workers). This despite the fact that in opting for the functional analysis methodology, the British sought to avoid the voluminous specification of skills and tasks characteristic of the traditional job task analysis.

At root of these problems is not the functional analysis methodology *per se* but the fact that the British launched the NVQ system without conducting labor market analyses of the kinds of occupations for which skill standards should be defined and without developing an over-riding vision that would help to foster involvement and consensus by employers in the standard-setting process. In its eagerness to get employers involved in standard-setting, the government gave responsibility for the process to existing industry and professional bodies or to newly

formed coalitions of such groups. The result was that the standards reflect not only the proliferation and redundancy of these lead bodies -- there are currently over 150 of them -- but also the often antiquated occupational structures they represent.

In fairness to the British, this approach may have been the most expedient given the perception of crisis in the mid-1980s over the large number of young people who were entering the workforce directly out of compulsory school with few skills, a trend that was seen as threatening the country's ability to compete in global markets. The NVQs were proposed as a way of providing these young people with a structured approach to learning on the job and with a credential designed to motivate them to pursue learning further whether on-the-job or through more formal schooling. Indeed, British industry seems to have bought into what is clearly a rather bureaucratic system at least in part because of the promise it held for improving the skills of the growing low skill segment of the workforce. Moreover, there may have been no other choice but to turn to existing industry groups in mobilizing employer involvement in NVQ standard-setting and support for NVQ qualifications.

However, the upshot of handing over standard-setting to industry has been the development of standards that in general seem to us to be too focused on narrow occupation-specific competencies and too oriented toward low-skill jobs. Noticeably absent from the NVQ standards is attention to broader competencies of a sort critical to the ability to learn new job-specific skills, for example, communication, problem solving, and use of technology. This casts doubt on the appropriateness of the NVQ system for youth training -- one of the main purposes it was designed to serve. Indeed, we wonder how appropriate NVQ standards (especially those at the lower levels) are for guiding the training even of incumbent workers, for whom, given the increasing pace of technological change, the ability to learn is as important as for new entrants to the labor force. Our misgivings were supported by a number of employers we met with. As one of them said, "The lead bodies are setting standards not for the jobs of tomorrow, but for the jobs of yesterday."

The narrow definition of NVQ standards around occupation-specific competencies is not surprising given that in the NVQ standard-setting process there is nothing to counter-balance the interest of employers in providing only as much training as is necessary to enable workers to do their current jobs. Although the NVQs may offer the British worker a means of recognition for the skills he or she acquires on the job where before there was none, it is not clear to us how much they benefit the worker by giving incentives to their employers to provide training that would not otherwise not be offered.

A company training manager who has long been involved in vocational education in Scotland argued that the government's strategy for implementing the NVQ system has suffered from conflicting aims. On the one hand, the government wants NVQ standards to have a positive impact on workforce development and economic performance. On the other hand, it wants to ensure broad participation in the process by industry. These aims are in conflict because the former relies on high standards and yet the latter leads to a watering down of standards. This

manager believes that the government should work to ensure that standards remain high. Competition, not coaxing or coercion by government, will compel companies to make productive use of high skill standards, he believes.

Perhaps an unanticipated benefit of the NVQs is that a growing number of firms, especially large ones, are beginning to use NVQ standards as a tool for restructuring their training and management practices with a view to improving the performance of their workforces. At a United Distillers plant we visited in Glasgow, we heard how NVQ-like standards played a key role in enabling the company to move to a flatter, more efficient management structure following a turbulent takeover by Guinness. The company has also used standards to rethink what it expects of its production workers and what training it needs to provide to enable them to meet these expectations. A recent survey of employers by the Confederation for British Industry found that companies that use NVQs in hiring and training employees also tend to use ISO 9000 or some other quality management standards in seeking to improve organizational performance, suggesting that the use of these practices goes hand in hand.

The use of NVQ standards by large companies as a tool for enhancing workforce skills and improving organizational performance is generating interest in NVQs among other employers. This bodes well for the NVQ initiative, since only if standards add value by answering a real business need will they be used by employers in the long run. Moreover, only if they lead to real learning by workers will they benefit the economy overall.

GNVQs: Limited employer involvement in standard-setting

It was in part a recognition of the limitations of NVQs for providing a sufficiently broad-based preparation of young people for entry into the workforce that, in the late 1980s, led to a call for the GNVQs. The GNVQs are designed to prepare for entry into broad occupational streams, not to train for specific occupations or jobs. They are aimed primarily at young people in the 16-19 age range and are intended to be offered primarily in schools and further education colleges rather than in the workplace. This past year they were piloted in 100 schools and colleges and this year they are being offered in schools and colleges generally, though much development work remains to be done.

GNVQ standards are couched in a format similar to that of the NVQs. Page 1 of Exhibit 8 contains a list of the units and elements of competence for the GNVQ Level 2 qualification in Manufacturing, while the next page details the performance criteria, etc. for the first element. The broader nature of GNVQ standards compared with the NVQs is evident from a comparison of these examples with Exhibits 4-6. In addition, GNVQ programs include required units in the "core skills" of communication, application of number and information technology, which are designed to be integrated with instruction in the technical subject matter units, thereby broadening the GNVQs further.

Standards for GNVQs are being developed not by the lead bodies but by awarding bodies through task forces established for that purpose. By giving responsibility for GNVQ development to these task forces rather than to the lead bodies, the government sought to

avoid the proliferation of qualifications that has characterized the NVQs. During our meetings at the Employment Department we were told that: "One goal of GNVQ development was to limit the number of GNVQ programs to no more than 15 occupational streams. If we'd had the lead bodies develop the programs, we'd have 150 or more." Exhibit 7 lists the streams in which GNVQs are to be developed, with a timetable for the development of each.

The task forces charged with setting standards for particular GNVQ streams do however include representatives from lead bodies in relevant fields. The role of these lead body representatives is to ensure that GNVQ standards reflect competencies required for a range of occupations in their fields. The majority of those on these task forces are educators, however, which has led at least some employers to express skepticism over whether GNVQs really will ultimately help to meet the needs of employers for broadly-trained workers. NCVQ has recently set up subject area advisory committees to each of the newly established GNVQs. These advisory committees will also include industry representatives whose role will be to ensure that GNVQs are implemented and GNVQ standards are updated in line with the needs of industry.

The SCOTVEC National Certificate: Sector Boards for Employer Review of Standards

Scottish vocational qualifications are based on modules to allow for maximum flexibility in creating courses of study appropriate to the needs of the user. Each module is defined by a descriptor, which provides all the information a teacher would need to devise an appropriate program of study. Exhibit 9 outlines the components of such a descriptor.

Among other things, the descriptor clearly states the learning outcomes to be demonstrated by the student and the criteria to be used in judging whether the student has indeed achieved the outcomes. Thus, the standards are an inherent part of the modules and their development takes place in concert with module development. Whoever develops the module for a qualification in effect defines the standards for it. However, since every module must be approved by SCOTVEC, the awarding body for vocational qualifications in Scotland, SCOTVEC is the final arbiter of standards.

Employers were not much involved in the early development of National Certificate modules following the Scottish Action Plan of 1983. Most modules were developed under the auspices of the Scottish Technical Education Council (SCOTEC) and the Scottish Business Education Council (SCOTBEC), the forerunners of SCOTVEC; they were written by officers of those bodies, Her Majesty's Inspectors (the inspection wing of the Scottish Office Education Department), and by others selected for that purpose. In recent years, employers have played a larger role in developing modules, often in partnership with further education colleges. Also, as the NVQ system has come on-line, SCOTVEC has developed modules based on the standards developed for the NVQs by the U.K.-wide industry lead bodies. These Scottish variants of the NVQs are called, appropriately enough, "SVQs" -- Scottish Vocational Qualifications.

Of more importance for the system of Scottish vocational qualifications, SCOTVEC has instituted a mechanism for review of modules (including the inherent standards) by boards representing broad industry sectors. There are eight such boards, each composed of around 25 representatives from industry and education, with representatives of the latter from both further education colleges and universities. These boards are responsible for "validating" every SCOTVEC module in their sector. The actual work is done by a validation panel that typically has two representatives from industry, two from education and one from SCOTVEC. According to SCOTVEC, the sector boards provide excellent feedback on the quality and relevance of its products.

In addition to validating new modules, the sector boards are instrumental in reviewing and suggesting revisions to existing ones. Of the more than 3,000 modules in the Scottish system, about 300 undergo such an overhaul each year. By many accounts, the modular nature of the Scottish vocational qualifications makes them easy to update. Ian Muir, a training manager at GEC Marconi, who is chairman of the Engineering and Manufacture Sector Board, believes that the sector boards are effective means of keeping modules (and thus the standards) up-to-date.

With the sector board review, the Scots seem to have found a better way to involve employers in the standard-setting process than the approach used with the NVQs, where employers are given wide latitude in the setting of standards, and the GNVQs, where employer involvement has thus far been limited. As the final approver of modules, SCOTVEC has at least the potential to strike a better balance in the setting between the drive of some employers at least to train in narrow, job specific skills, on the one hand, and the need of employees (and prospective employees) to master broad, transferable skills, on the other.

This is not to say that finding that balance is easy. Chris Brown of SCOTVEC says that the most challenging part of SCOTVEC's work is to walk the fine line between over-specifying standards (as in "link the blue pipe to the pink pipe to the spotted pipe") and over-generalizing them (as in "install devices," where it is not clear whether "devices" refers to a light bulb or an engine on the QE2.)

Some members of our team point to the large number of National Certificate modules as evidence that the drive by employers for highly-specialized, occupation-specific standards has not been mitigated by the SCOTVEC review system. Yet, while the Scottish system was designed to be completely modular, with no formal inter-linkages between modules, there has been pressure from the start to offer groups of modules in more cohesive packages. Much of this pressure has come from employers, who want to see their employees take a coherent program of study rather than just discrete modules. Grouping modules into coherent programs has not proved to be a problem. For example, the Scots are creating their own version of the GNVQs -- the GSVQs -- by bundling the appropriate National Certificate modules.

The need to provide a more cohesive structure to the National Certificate modules was among the major recommendations of the Howie Committee (SOED 1992), which was commissioned by the Scottish Office Education Department to study the structure of upper-secondary

education in Scotland. A precedent for this is provided by the Higher National Certificates and Diplomas, which were converted to a modular format following the Action Plan but still retain their earlier structure. According to several people we met in Scotland, these have a good reputation among employers, who see them as offering a high quality technical level education.

LESSONS FOR THE U.S.

- *Establish a single body to oversee the setting of skill standards for all occupations and industries.*

Both the Danes and the British recognize the importance of national standards, which allow for comparability of programs and portability of credentials (the latter of which facilitates labor mobility). In both countries, there is a unitary structure through which standards for vocational education and training are set. Without a single body or umbrella organization to ensure the consistency of standards across programs and industries, it is hard to see how standards that are truly "national" could be set. A centralized standard-setting body also provides an accessible forum for business influence over the training system. In the U.S., the highly decentralized nature of systems for developing standards and curricula for vocational education makes it difficult for business to exercise any real control over the content or quality of vocational programs offered by schools.

From this perspective, the National Skills Standards Board that has been proposed as part of President Clinton's Goals 2000 initiative seems to make a lot of sense. This board and any bodies that underlie it should be constituted to ensure a balance between the primary interest of employers in education that is relevant to the work they do, and the interest of employees (and educators) for education that also prepares for a lifetime of learning both in and outside of the workplace. Denmark, with its coordinated structure of trade committees, each with equal representation of business and labor, is in many ways ideal. This structure is not likely to be replicated in the U.S., however. The Scottish model, with review of standards by sector boards representing industry and education, but with a single awarding body to serve as final arbiter, is a model that might be more feasible for the United States.

Scotland is moving toward a structure for the setting of standards that makes even more sense than its current system. In this new scheme, proposed by the Howie Committee, SCOTVEC would be merged with the body that currently oversees the setting of standards and credentials for academic education at the upper secondary and postsecondary levels. This unified structure is seen as necessary for promoting integration of academic and vocational learning, facilitating cross-over between the different "paths" and raising vocational education to a status on a par with academic education.

- *Couch standards in terms of broad goals and frameworks; avoid detailed specifications and regulations. Empower those best positioned to affect learning -- teachers, trainers, administrators and students themselves -- to work out the details of how to meet the standards.*

Both the Danes and the British have learned from experience that only by setting standards broadly does a system of vocational education based on standards have any hope of keeping up with the increasingly fast pace of change in the technology and practice of work. In the 1960s and 1970s, the Danes set standards for vocational education in great detail. They abandoned this approach, having found that it was too inflexible. They have since taken the tack of "steering the system by broad targets and frameworks" rather than attempting to control it through detailed regulations.

The English have had more recent experience with the deleterious effects of trying to control educational practice with standards in the disastrous start-up of the National Curriculum, an effort to establish national standards for secondary school education. The idea received strong support from many sectors, including teachers. Evidently, however, the National Curriculum Council, which was established by the government to define the standards, was overzealous in carrying out its charge. According to a government official we spoke with, "The Council over-specified in staggering, patronizing detail what students are to achieve." The result was a widespread revolt among teachers, who saw the volumes of standards being produced by the Council as a violation of their professional authority. The government has since abolished the Council and established a new body, which is more representative of teachers and others closer to the practice of teaching.

The experience of the National Curriculum shows how trying to use standards as a means of control frustrates teachers. The opposite approach, using standards to set broad goals for student learning, and empowering teachers to figure out how to help students reach those goals, has an energizing effect on teachers. Teachers are able to use their professional knowledge in finding ways to meet the needs of the individual learner. They are more likely to be committed to the system because their role as professionals is valued. Unfortunately, we in the U.S. do not show much respect for the professional authority of teachers.

The approach of using standards to steer rather than control also makes the system more responsive to the demands of the market. In the mid-1980s, following the Scottish Action Plan, the Scottish Higher National Certificate programs, which had long existed as a more applied alternative to the highly academic university preparation system, were converted to a competency based format based on broad standards. Since then, enrollment in these programs has soared, and they are now favored by employers, who see them as providing solid preparation for technician level workers.

The lessons we can draw as to what methods should be used in standard setting are less conclusive. The strength of the Danish frameworks for vocational education is that they are stated in terms of what students should be able to do as a result of a particular course of study. However, they may be too specific about what is to be taught at particular points in a program to be useful in the U.S., where there is a strong traditional of "local control" over the curriculum.

The functional analysis methodology being used in the British NVQ system is an intriguing alternative to the classical job task analysis approach to defining the skills needed for work.

The British experience indicates, however, that the standards methodology itself cannot break down the sometimes artificial boundaries between "jobs" to enable standards development across broadly defined "work roles." The standards developed through this method will reflect how broadly or narrowly work roles are defined. The NVQ standards contain some very good models of standards based on broadly defined work roles (see Exhibit 10), but we also saw many examples that were clearly grounded in the discrete tasks of narrowly defined jobs. Both seem to be the result of a lead body's judgment on how to define an "occupation" that merits standards development, prior to actual development of standards. The definition of work roles is not always clear-cut, given that similar roles cut across many types of industries but may not normally be thought of as related. Interestingly, in the development of GNVQs, analysis of labor markets and employers needs prior to the development of standards led to very broad grouping of standards around ten "occupational streams." It is still not clear how the GNVQ categories will link in practice to the NVQ standards.

The competency maps that are being produced for the NVQs and GNVQs could be a helpful benchmarking tool for the U.S. In the best cases, such maps provide an efficient way to represent standards for content and performance in a form useful for guiding instruction and assessment.

- *Understand that standards by themselves will not drive systemic reform.*

Standards, by the very nature of the process through which they are set, are bound to lag behind the emerging practices and needs of business. It takes a great deal of time, even in the most flexible systems, to develop the consensus needed to establish or change a standard. Given the size and diversity of the U.S. compared to the countries we visited, the process is bound to be slow even if standards are couched in broad terms.

The Danish system shows that the standard-setting process in itself doesn't ensure the responsiveness of the training system. The main source of innovation and responsiveness is the joint development by schools and the partners of actual programs at the local level. This on-going collaboration on the design and delivery of programs informs the continual refining and adaptation of standards to meet the changing needs of employers. The Danes see the most appropriate use of standards as signaling broad national goals that steer the process of innovation and as codifying and helping to replicate advances in practice.

Hence, it is not standards *per se*, but on-going communication in and among all levels of the system about what is expected from the learner that drives innovation in the system. Standards can provide a common language and focus for this communication, but they can not substitute for it.

- *Begin by building a national consensus about the aims of vocational education.*

In the setting of standards for vocational education, the Danes benefit from the active involvement of business and labor based on a partnership built up over the course of a century

or more. Lacking a similar history of involvement in education by industry, the British have had to aggressively court employers to become involved in the development of the new NVQ system. To foster a sense of ownership among employers for the NVQ qualifications, the government turned over the setting of NVQ standards to industry lead bodies. This has succeeded in encouraging widespread industry participation in standard-setting, but has also led to some serious problems, including the proliferation of standards, many of which reflect narrowly-defined, and often low-skill, jobs rather than broad work roles. In hindsight, these problems might have been avoided had the British been more selective in specifying the groups or families of occupations and the levels of jobs for which standards should be set. Instead, they leapt into the process as though the goal was to set standards for virtually every occupation in the labor market, no matter how low-skill or antiquated.

As the support builds in the U.S. for the establishment of a system of vocational education and training based on industry skill standards, it would behoove us to learn from the British experience and be more strategic in the development of our system. In particular, the first step should be to build a consensus, based on strategic analysis of labor market trends, about the purposes the system is to achieve and about the approaches appropriate to meeting those goals. Like the British, we in the U.S. will face the challenge of finding a balance between the goals of mobilizing broad involvement in standard-setting by industry and generating standards that will foster development of the workforce.

- *Use the restructuring of companies around high performance management practices as the lever for encouraging employers to use skill standards for training and organizational development.*

Active involvement by industry in the setting of standards for vocational education and training is essential if the programs based on these standards are to meet the needs of the economy for a skilled workforce. The viability of vocational programs where industry is not directly involved in setting goals and standards should be seriously questioned. This is the case in general with vocational education in the U.S. high schools, where the level of employer involvement tends to be low. In Denmark and Britain, vocational education does not begin until after compulsory schooling (which ends at age 16) and is offered in institutions more akin to our community colleges than our high schools. Like the best of our community colleges, these institutions are in constant communication with industry, both through industry advisory boards to their programs and through their efforts to provide contract training to companies.

An increasing number of companies in Denmark and Britain are seeing involvement in vocational education and investment in the training of their own workers as key elements of a larger strategy for meeting the growing challenge of international competition. This larger strategy involves restructuring around the ideas promulgated under the labels of "lean production," "total quality," or "high performance management." They are reflected in the requirements for ISO 9000 certification, which is increasingly seen by companies in Europe and throughout the world as a prerequisite to doing business in international markets.

In Great Britain in particular, some companies are finding that skill standards are a useful tool in becoming high performance workplaces. These companies are using skill standards to rethink what they expect of their workers and how they can train and organize workers to enable them to meet these expectations. For standards to be used effectively in this way, efforts must be made to ensure that they reflect the broad demands of high performance work -- the high-skill, high-wage jobs of tomorrow -- rather than the narrow requirements of the jobs of yesterday. A model for achieving this in the U.S. may be found in the Scottish approach, where industry has direct input on standards through participation in industry sector boards, but where the impulse of small employers especially for job-specific training is mitigated by the presence on the boards of educators and by SCOTVEC's commitment to ensuring that vocational education is broad enough to allow for portability of learning.

This approach of setting standards high and then relying on industry, under the force of competition, to follow the lead of high performance organizations seems to us to be only way to ensure that the process of setting skill standards has a positive impact on the skills of the workforce and thus on economic development. The tradeoff is that many companies and perhaps whole sectors that rely on low-skill, low-wage work will not take part. Still, this seems to be a tradeoff worth making, since the setting of standards for low-skill work is likely to use up lots of energy without generating much value in the way of real learning.

Government can play a role not only by working to keep standards high, but by encouraging industry to adopt high performance approaches to management. The British government is seeking to encourage employers to use skill standards as a tool for improving human resource development through its "Investors in People" program. Run by the Employment Department, "Investors in People" is an award given to employers that meet certain criteria of quality in their human resource development practices. As opposed to a competition in which only a handful of organizations are recognized (e.g., our Malcolm Baldridge Award), Investors in People is a certification of high standards of practice that any number of organizations can achieve.

Some of the further education colleges we visited in England and Scotland were consulting with local companies on developing training plans and other practices necessary to earn Investors in People certification. These colleges had earned the certification themselves. Similarly, at least one of the technical colleges we visited in Denmark was working with local employers to achieve ISO 9000 certification. The potential benefits for both the college and the employer of working together on such efforts are great.

2. How do standards shape what is taught?

Main issues of interest to the team:

- How to design standards to promote the development of programs that both prepare young people for entry into specific occupations and provide a broad foundation for future employment and life;

- How to structure education programs to encourage the transferability of learning.

DANISH APPROACH

The history of the modern Danish apprenticeship system has been characterized by an increasing role of school in the training of apprentices. The modern system traces its roots back to the Apprenticeship Act of 1889, which made education for apprentices compulsory and provided schools with state funding. In the early part of this century, a common school curriculum and standard examination requirements were established. The Apprenticeship Act of 1956 implemented a decision to gradually move the school part of training from evening classes to day classes. A key motivation for increasing the role of schooling has been the recognition that, with the increasing pace of technological change, the education of the skilled worker has to be broader than that afforded only through training on-the-job.

The past thirty years have seen continued efforts to broaden the education of apprentices further, with a focus on the school part of training. The 1991 reform codified as broad goals for the system the results of experimentation and debate over a decade or more on how to accomplish this. The reform brought about major changes to the first year of instruction in school, but the overall structure of a course of study in vocational education, in particular, the "sandwich model," where students alternate between periods of training in-school and on-the-job, remained as it was before. The current structure is shown in Exhibit 12.

The impetus for the reform came from two directions. On the one hand, the partners (see p. 7), through the trade committees, pushed for broader education out of a recognition that not only was the pace of economic and technological change increasing, but, for this reason, workers were changing jobs much more frequently. On the other hand, educators and the Ministry of Education sought to enhance the flexibility of students in vocational education to cross over to an academic path, and, of most importance, to continue on at some point in higher education.

In relating the reasons that the partners were behind the recent reform, Jørgen Andersen of the Danish Metalworkers Union told us:

> "The apprentice thinks he will have the same job for which he is being trained all his life. That is a fantasy. The key is learning to learn. This key element must be part of all education . . . . The trade committees have pushed hard for providing as broad an education as possible, even though a narrow education would be less costly. This is based on the realization that a [broader] education gives one greater flexibility to change jobs."

We heard a similar view from Finn Larsen of the Danish Labor Organization.

> "Behind the reform was an effort to change people's thinking: no longer will a union card alone be a guarantee of a job; it is the ability to learn that will guarantee you employment in the economy of the future."

To accomplish this broadening, the partners consolidated programs in particular trades, reducing the number from 270 or so to under 90. The partners also advocated articulating as one of the main goals of the reform the idea that "education should be holistic." By this, they sought to find a better balance in vocational education between the theoretical and the practical. Certain trades also saw this as encouraging the teaching of skills not traditionally emphasized in the academic canon. Exhibit 13 contains a list of such skills. The list was developed by the Metalworkers Union through a 1986 project in which focus groups of 70-80 of the leading employers in the metalworking industry were convened and asked "What do you foresee will be the 'basics' required of workers in the 1990s?". (We gather that these skills are reflected in the frameworks for the metalworking trades, but these frameworks were not available in English.)

Holistic education was also advocated by Danish educators, but to them this meant promoting interdisciplinary instruction within the academic domains and discouraging the teaching of subjects separately -- "because the real world is not broken down in that way." At the same time, the educators' answer to the need for a broader education in order to enhance student flexibility was mainly a push for more academic content in the curriculum. The 1991 reform increased the number and rigor of required academic courses and added an examination to be taken after the subject matter courses are completed.

The increased academic requirements have made it difficult to realize in practice the goal of making vocational education more holistic, at least in the sense intended by the partners. Academic and practical instruction remain separate, especially in the first year. The required academic courses are given mostly in the first year so that students can get the exam out of the way and proceed to practical training in subsequent years. According to the practical teachers we spoke with, this cuts into the time students can spend in hands-on learning in the workshop during the first year. Some of these teachers also believe that the heavy load of academic courses in the first year discourages students and leads to a high drop-out rate. In both the technical colleges we visited, over 20 percent of students drop out in the first 20 weeks. Many of these drop-outs enter vocational education in another field, but at least some are discouraged and never continue their education beyond that point.

The separation between academic and practical instruction is difficult to bridge because the two are governed by different standards and taught by different teachers. While the trade committee frameworks specify the structure of the entire program, it is left to educators, through the Ministry of Education, to set standards for the academic subject matter courses. Teachers of academic courses are required to have university degrees, whereas teachers of practical subjects are not. While some of the latter do have degrees, all have come through the vocational education system. In practice, there is some communication between academic

and practical teachers, but not much, according to the teachers we spoke with. By insisting that education be holistic, the 1991 reform obligated academic and practical teachers to work more closely together, but failed to remove the structural barriers to this sort of cooperation.

This structural divide between the academic and the practical is not easy to overcome, in part because it reflects differing views of how to achieve portability or transferability of learning. When we asked a practical teacher the reason the reform called for such a heavy academic course load in the first year of the program, he responded:

> "Academics at the University of Ålborg were behind this. They did a study that found that people in the workforce are changing jobs more. They said, 'Aha! Then we should put greater emphasis on academics in vocational programs, because that will lead to transfer of skills.'"

When we asked this same teacher what he thought was the best way to prepare young people for a lifetime of frequent job changes, he said, "give them lots of experience working with tools." A similar view was expressed when we asked representatives of the partners how they can justify encouraging young people to become apprentices, when two-thirds or more cannot find jobs in the trades in which they were trained.

> "If you have a skill, say, you are a barber, then somehow you will be able to use your skill, even if not in the field in which you were trained."

> "[The inability of apprentices to get jobs in their trade] is not a problem because you can't be disciplined at anything if you are not disciplined in at least one thing."

By this view, it is the experience of having mastered a set of skills, not abstract knowledge, that enables one to learn new things and deal with unfamiliar situations. Some of the practical teachers we met also emphasized the importance of the sense of accomplishment and confidence that comes from mastering a skill, producing a product, or solving a practical problem. Most students do not get this from book learning alone. This is overlooked in the current model, where students spend much of the first year taking academic courses like those they took in Folkeskole.

Practical learning can motivate students to want to acquire a more theoretical understanding, according to one teacher.

> "The students we get are the weak students from the Folkeskole. Many of them are immigrants. We start them out with the same school stuff they took in the Folkeskole and they hate it. They feel like failures. But, later in the program, when we are working on projects in the workshop, students are very eager to do the academic work."

A better approach, according to this teacher, would be to start students off with a set of hands-on projects that get them interested in learning and then to build-in theoretical instruction, as needed, to understand what they are doing in the practical work. There would still be plenty of time for specialization," the teacher pointed out.

This is closer to the way learning is organized in the "practical period" of training following the first year. Ideally during that period, students work on projects with coaching from the teacher, who provides instruction or points to other resources when questions of theory arise in the course of carrying out a particular project. The 1991 reform has encouraged this approach of "theoretical learning as needed to support practical learning" in the practical period. At the Metal Industries Technical College outside Copenhagen, classrooms used to be separate from the workshop. The school is now being redesigned so that classrooms encircle the workshop. Teachers and students will use the classrooms for planning projects to be carried out in the workplace and for instruction on topics relevant to projects underway there. This reorganization of the school mirrors the restructuring in at least four of the companies we visited in Europe, where R&D operations were being moved next to the factory in order to facilitate symbiosis of theory and practice.

Despite some advances in the direction of more holistic education, the Danes are still struggling with how to accomplish this. A key challenge will be to break down the separation of academic and practical learning that characterizes the first year of technical programs. This will require academic and practical teachers to work together and to understand and respect each other's cultures. Some of the efforts to change teaching in this direction are discussed in the section on teaching methods.

British Approach

Like the Danes, the British have been trying to come up with a design for vocational education that is broad enough to promote transferability of learning but is not so broad that students fail to acquire skills that help them to get jobs. The most recent attempt is the General National Vocational Qualifications (GNVQs), which, as mentioned above, are designed to provide a framework for school-based vocational education programs, primarily for students of ages 16-19. They are intended to signify preparedness for entry into a broad stream of occupations, not competence in a particular occupation (the latter being the role of the NVQs).

The GNVQs were developed to meet two major needs. The first was the need to create a school-based alternative to the work-based NVQ, which, unlike the NVQ, would aim to teach broader skills than those specific to a particular occupation. The second was to provide a more applied alternative to the highly academic and highly exclusionary A-level examination system as a means of preparation for university-level study.

GNVQs are made up of a series of units that are defined by competence maps similar in format to those used to define NVQ standards. (See Exhibit 8 for an example of a GNVQ competency map.) As with the NVQs, each GNVQ unit is competency-based, which means that a student completes a unit by demonstrating the competencies required by the unit.

Students document their progress toward meeting the various competencies in a portfolio of evidence. Like NVQs also, GNVQs are defined in a framework of five levels. Exhibit 14 shows the structure of GNVQ Level 3 programs.

GNVQs differ from NVQs in that standards of competence are defined more broadly. Moreover, GNVQs modules include core skills units in addition to content area units. The core skills units represent areas of competence that cut across technical or content-area skills and knowledge. They are seen as fundamental to learning new knowledge and skills; therefore their inclusion in the GNVQs is a key strategy for ensuring the transferability of the learning that takes place in GNVQ instruction. The core skills units are required to be taught in conjunction with the content area units. The challenges posed by this requirement are discussed in the next section.

The core skills are as follows:

- Communication
- Application of Number (Numeracy)
- Information Technology
- Personal Skills (Working with Others and Improving One's Own Learning and Performance)
- Problem-solving
- Modern Foreign Language
- Personal Effectiveness (Planning, Managing Others, Managing Oneself and Using Intellect)

Under the current scheme approved by the government, only the first three core skills units are required; the fourth is highly recommended. The elements of competence for the first three required core skills are outlined in Exhibit 15. Problem-solving is not required because it is thought to be too dependent upon the context of learning, and thus not amenable to standardization and reliable assessment, as are the first four. Standards have been defined for Modern Foreign Language units, but the government chose not to include them among the required units because it was concerned that it could not field a sufficient number of foreign language teachers. Finally, the four personal effectiveness dimensions are not required because they are considered to be too subjective and dependent on organizational context and culture to allow for standardization. Still, the government thinks that they are important and wants to promote their use. Using models developed by large corporations, the government is working on frameworks for measuring, documenting and tracking these dimensions that are more accessible to schools and small organizations.

Development of core skills units has been in progress for at least a decade, much of it through government-funded demonstration projects. A well-structured program of research has been designed around the piloting of the GNVQs over the past two to three years. (See Oates 1992 for an excellent review of this research.) This research will continue now that the GNVQs are being offered on a national basis.

Much of the early work on core skills was done in Scotland, in response to the Scottish Action Plan, which saw broad enabling skills as key to ensuring adaptability in employment and further learning. The core skills are clearly reflected in National Curriculum modules, both in separate core skills modules (e.g., communication, application of number, etc.) and as outcomes embedded in vocational modules.

Despite more than a decade of experimentation, the use of core skills in teaching in Scottish vocational education is far from universal. As Sheila Clarke reports in a recent review of vocational education in Scotland,

> [I]n evaluating the implementation of the NC, an HMI report concluded that while examples were found of programmes with strong emphasis on core skills, such good practice was attributable to effective teaching or programme design by individuals rather than to college strategy. (Clarke 1992: 27)

Clarke cites a number of reasons for this, including "the lack of models of good practice and staff development," and "uncertainty over whether there is transferability of core skills."

Use of core skills is not more widespread in part because they are not required to be part of National Certificate programs. As was indicated earlier, the National Certificate modules were designed to allow users maximum flexibility in putting together NC modules to meet their own needs. Giving users this sort of license has its advantages, to be true, but the result is not always in the best interest of the learner. Clarke cites other research suggesting another reason core skills are not more widely applied: small and medium sized companies have not adopted core skills initiatives advocated by larger firms, but see their training needs as more immediate. Therefore, colleges have left out core skills from the programs they design for these companies. The result is narrow training for the student rather than an education.

As was mentioned above, the wide latitude that the National Certificate system gives the learner to assemble a program of study from modules of their choice is currently under scrutiny. Indeed, many programs are offered as group awards, more structured groups of modules that in many cases include core skills modules. And SCOTVEC has developed Scottish equivalents of the GNVQs -- the GSVQs -- by packaging existing National Certificate modules, including those for the core skills.

What we find attractive about the GNVQs is that the core skills are a required part of the framework and, moreover, that they are required to be integrated with the teaching of technical or content area subject matter. It is still too early to tell the extent to which this integration will promote transferability of learning. This is a key item on the research agenda for British vocational education. In the U.S. we should keep an eye out for results of this research, but we cannot afford to wait until they are in to begin similar work of our own.

LESSONS FOR THE U.S.

- *Ensure that goals and standards for the system reflect a balance between theoretical and practical learning*

The balance needs to be reflected in the standards if it is to be manifested in teaching and learning. One reason that the Danes have had such problems with achieving more holistic education in the first year of vocational education programs is that the standards that govern the academic courses are established independently of those for the practical studies. In Scotland, there are discrete core skills modules and core skills are reflected in the outcomes for vocational modules, but core skills are not universally reflected in teaching because they are not required elements of National Certificate programs.

The GNVQs present a model for achieving the kind of balance that should be reflected in content standards for vocational education in the U.S. Core skills are defined with their own standards separate from those for subject matter domains, yet the GNVQ frameworks require that core skills be taught in conjunction with subject area content.

- *Question the assumption that academic learning leads to superior transferability of skills and knowledge.*

Both the Danes and the British are trying to create vocational programs that are occupationally-relevant and yet that allow for transferability of skills. Neither has found the definitive answer about what makes for transferable learning. Still, both are discovering -- spurred by the work on training and organizational learning by high performance companies -- that the answer lies in a better balance between theoretical and practical learning. This should cause us to question the assumption, underlying the design of U.S. education at all levels, that academic learning leads to superior transferability of skills and knowledge.

In the best examples from Denmark and Great Britain, learning is organized according to projects designed to allow students to tackle practical problems in-depth and motivate them to investigate theoretical issues as needed. This is the case in the Metalindustries Technical College in Denmark, where students undertake practical projects in the workshop with coaching from the teacher, using the classrooms that ring the workshop as needed to explore theoretical issues relevant to their project work.

The balance between academic and applied learning is reflected in the teaching of academic subjects in Denmark. This is evident from three pages in a Danish mathematics textbook for the ninth grade, presented as Exhibit 16. The discussion of geometry begins with pictures with geometric manipulatives that the student could actually make and play with in order to get a hands-on understanding of geometric forms. On the same page, the connection is made to how geometric forms are reflected in real world objects -- in this case a bridge -- and to the use of geometric skills -- in this case in the construction of a frame for a house. On the next page, further connections are made to the geometry of angles in the game of pool (a common Danish pastime). Only after the real-world links have been established are the abstract

notations for geometric properties of angles and the like introduced. Some students may never use this last form, but at least a connection has been made to application.

In our system, the connection is not made, since we only teach the abstract math. Those students who go on to do advanced mathematics will lack a grounding in hands-on experience and understanding of the practical application of mathematics. Students who have difficulty with the abstract concepts are given "applied mathematics," but only after they have developed a sense that they are no good at mathematics.

3. What is the role of standards in promoting innovation in teaching?

Main issue of interest to the team:

- How to use standards to encourage methods of teaching that engage students in learning and enable them to apply what they learn to new problems and situations?

DANISH APPROACH

According to Jens Pehrsen of the Danish Ministry of Education, the goal set forth in the 1991 reform of making vocational education "holistic" carried with it a new set of obligations for the teachers of the system. To achieve this goal, says Pehrsen,

- Practical teachers and academic teachers must work together;
- Partners have to say to practical teachers and skilled trades people (who serve as mentors and assessors for apprentices) that young people need to have a broader education than they had;
- Teachers' unions must stress to the academic teachers the need to make education more interdisciplinary and applied.

Two years later, the teachers of the system are still struggling with how to fulfill the new roles called for by the reform. This is not to say that all this is new. The ideas promulgated by the reform have all been developed and tried out in demonstration projects or by teachers and colleges working on their own. Now the challenge is to spread these ideas across the system so that innovations become common practice.

Two innovations around which there seems to be a lot of interest and experimentation in Denmark are team teaching and project teaching.

Team Teaching

One of the thrusts of the reform was to take teaching out of the subject and put it into the team. Within Danish vocational education, according to Jens Pehrsen of the Ministry of

Education, some have long argued that students should not be taught subjects separately, "since the world that they are being prepared for is not broken down that way." For at least a decade leading up to the reform, the Ministry funded R&D projects aimed at creating models of interdisciplinary teaching. In these projects, teachers served as the primary "researchers."

Beyond these demonstration projects, teaching has still tended to be along disciplinary lines. However, team teaching seems to have long been the norm in the operations through which the technical colleges offer contract training to companies. Jens Erik Simonsen of Århus Technical College said that the short time frame in which most contract training has to be developed typically requires that they be designed by an interdisciplinary team. Still, he says that this approach has not spilled over much into the planned courses of the regular curriculum.

The biggest challenge is to get practical teachers and theoretical teachers to work together as a team. At the Metalindustries Technical College on the outskirts of Copenhagen, teachers are working in teams to design and teach the program for an entire level of instruction, for example, the entire first year program. These efforts mirror those of high performance companies that assign to an interdisciplinary team responsibility for developing and managing an entire segment of an operation, for example the production line for a given product. This work has been going on for about a year, according to Jonna Blak of the college. The results have been good, with academic and practical teachers working together for the first time. Scheduling of students and classroom has become much more complicated, so the college has hired a scheduling coordinator.

Project Teaching

Another innovation in teaching encouraged by the reform is teaching through projects rather than lectures and lessons. Project teaching is often linked to team teaching since projects can often be developed and managed most feasibly by a team of teachers.

With project teaching as well, there has been a good deal of experimentation over the past decade in Denmark. An especially impressive example was the "Metalworking for the 90s" program, an experimental training program conceived by the Danish Metalworkers' Union and run jointly with industry through the metalworking trade committee. The purpose of the program was to explore new approaches to educating skilled workers in the face of dramatic changes in the metalworking industries. The program began in 1985, with the effort, mentioned earlier, of the metalworkers' trade association to define the skills that would be needed by skilled workers in the metal industries in the 1990s. (The list of competencies identified are shown in Exhibit 13.)

Apprentices in the program were given intensive training in problem-solving and teamwork. They were then required to carry out a series of projects, some of them several months in duration, that required them to work as a team. The instructors served as coaches, monitoring each student's performance through frequent meetings. The students' performance in these projects was used as the main criterion for deciding whether or not they passed the

journeyman's exam. (Apprentices in this experimental program received an equivalent amount of technical training as those in the regular program since an additional year was required by the experimental program.) When the program ended in 1992, over 75 apprentices had been trained in this way.

The program proved to be quite challenging for the teachers involved, according to Jørgen Andersen of the Metalworkers' Union. For one, the teachers found that they lacked some of the technical skills required to carry out the project. They had to pick these up just as the students did. Also, they had a hard time at first figuring out how to create a learning environment in the school that mirrored the workplace closely enough that the students would "get into it, could feel that they were actually working in an actual shipyard or some such." Most problematic, according to Andersen, was that the teachers did not know how to plan and manage a project. This way of operating was foreign to most of them. Even though courses were provided for teachers in the program, Andersen admits that they were not given enough support of the kind they needed. For one, the teachers would have benefited from training and support around project management, he believes.

Andersen and his colleagues have embarked on a new venture aimed at promoting teaching projects developed and carried out jointly by technical colleges, gymnasiums and employers. In one project, participants collaborated on the construction of a weather station. Four metalworking apprentices were involved. Andersen boasts that "they are much better at planning and organizing the project than the gymnasium students -- and the gymnasium students know it."

The move to project-based teaching is getting some encouragement from the budget cuts that colleges have been forced to make due to systematic cuts in funding from the government over the past couple of years. One response to the mandate to do less with more, according to Jonna Blak, is what is called "teacher-less teaching," where the teacher gives the students a project and makes themselves available to the students if they need help. That way, the teacher can manage 2 or 3 classes at a time. The alternative is to add more students per class. With this approach, students tend to help each other out, so the students are carrying some of the load of teaching.

Others indicated, however, that project teaching may be more expensive than the traditional lecture approach to teaching, precisely because you cannot simply pack more students in a classroom. Referring to the members of Parliament who are advocating the push for more holistic education, an official in the Ministry of Education told us, "they do not understand how expensive project teaching is." Project teaching requires a great deal of preparation time on the part of the teacher. Also, the need to be available to students to provide support and monitoring of progress does not permit the kind of student-to-teacher ratio possible in the traditional classroom. The solution to the funding dilemma lies in a new way of thinking, according to one administrator we spoke with:

"The expense of project teaching is not so bad as it seems, but you must not think about one instructor for so many students. You have to think of a team of instructors managing several

projects, each with a small group of students. You also have to be willing to give students more responsibility for the work."

How do teachers feel about all this?

The administrators we spoke to had mainly good things to say about the impact of the reforms on teachers and teaching.

> "Teachers have found that they like their fellow teachers better. Now academic and technical teachers talk when they did not in the past. Their education credentials matter less. Under the new system, it matters more what you can do."

> "There are problems, sure, but this will work in the end because teachers and students are enjoying what they are doing and you have to enjoy what you are learning to be motivated."

The teachers we met tended to be more reserved in their judgments. One teacher said that she liked the notion of projects, but she did not have time to work on them. Communication among the teachers involved in designing projects was difficult, even though time was set aside for planning. Also, the subject-matter exam that students were required to take at the end of the first year was not relevant to what she and her colleagues wanted to teach through the project. (The exam is discussed below in the section on "Assessment.") Another teacher said that teaching through projects "demands more of you, but it enables you to see students as they develop."

BRITISH APPROACH

In Britain, as in Denmark, the goals and frameworks articulated by the reforms in vocational education are causing teachers to rethink how they teach. Like Denmark, Britain is benefiting from a decade or more of experimentation with new methods of teaching, although the British too are a long way from truly systemic reform.

The GNVQ framework is promoting team teaching by teachers in different disciplines. Because the core skills are designed to be integrated with the technical subject matter, there is pressure on colleges and teachers not to offer separate modules in core skills. According to the staff we met with at the Employment Department (ED), when the GNVQs were being developed, there was pressure from some quarters not to require an integration of core skills units with vocational units in the GNVQs. The main reason was that teachers have not traditionally taught in an integrated way, and it was proposed to provide support for this more gradually. The Employment Department disagreed, on the principle that if this is not confronted head on, things will never change. The ED was resolved that things might not go well in the first pilots, but at least it would be a start. Plus, many difficulties would be worked out at the level of the school or college.

Based on our brief visits to colleges and schools in England, this strategy seems to have worked. At Monkwearmouth College in Sunderland, which was one of the 100 schools and colleges that took part in the pilot of GNVQs this past summer, efforts are underway to integrate core skills into technical modules, but, in the words of one school official, "we have a long way to go."

During last year's pilot, a number of lecturers at Monkwearmouth expressed unease at having to incorporate core skills in the teaching of their technical domain. In many such cases, the lecturer did not feel qualified to teach a particular core skill. Application of number and use of technology were commonly mentioned. The college found that using teams to develop and deliver modules helped to alleviate these anxieties while also accomplishing the required integration. Still, the college believes that not all core skills lend themselves to integration. It has established "flexible learning workshops" to provide instruction in those core skills elements that can not easily be integrated into the vocational units.

Team teaching is more common in the further education colleges of Scotland, thanks to the Action Plan of 1983. One teacher who has been involved with the colleges for a long time told us that, before the Action Plan, lecturers mostly worked alone, producing their own teaching materials and tests. The Action Plan called for curriculum to be produced in modules and required that modules be subject to "moderation," that is, that they be designed according to approved procedures and, more importantly, that they reflect the same standards across centers where they would be offered. The need to moderate modules encouraged developers to work in small teams. The use of teams spread with the rapid development of National Curriculum modules. Teams were traditionally used in teaching of the Higher National Certificate programs, so when the HNCs were converted to a modular format, the use of teams was well-received by teachers in those programs.

Several people indicated to us that the modular nature of the Scottish vocation encouraged the use of projects in teaching and assessment. During our visit to Cardonald College in Glasgow, two lecturers described to us projects that spanned several modules. Others we spoke to predicted that the required integration of core skills units with vocational units in the GSVQs -- the Scottish version of the GNVQ -- would increase the use of project teaching in those programs.

One obstacle to the use of projects for teaching in schools and colleges is the difficulty educators have in giving up coverage of the curriculum to allow for in-depth exploration of the sort afforded by project learning. This concern was raised by a training manager at a multinational in Scotland who has worked to promote the use of projects for teaching and learning in schools at the compulsory, further education and university levels.

> "What you hear from schools is, 'How can we take time out to organize projects when we have to cover all these other things?' I say that having a curriculum is one thing, but what we've got to do is prepare young people for the world of work. Industry today needs people with the 'how to skills' not the 'what skills.' Schools teach what they know best: facts and knowledge,

not thinking and problem-solving. Projects are excellent experience for students because they give them an opportunity to come up against new problems and circumstances. They build students' confidence to try new things, and what we sorely need in business is people who are willing to take chances. To make a project work, you've got to lay down the goals and then let things happen. But this takes management skills that the school people don't have. Plus, schools are not accustomed to giving control to students."

He went on to say that there is a similar reluctance on the part of business to set a strategy and then empower employees to figure out how to achieve it. But business needs to change, he believes, or it will not be able to keep up with the demands of fickle markets.

LESSONS FOR THE U.S.

- *Rely on standards for what students should be able to do, rather than directives of how teachers should teach, to drive innovation in teaching.*

The experimentation with methods of teaching that we witnessed in both Denmark and Great Britain has been catalyzed not by new directives on teaching, but by changes in goals and standards for student learning. Danish teachers are grappling with ways to achieve the goal, set forth in the recent reform, of making the education of students more holistic. Scottish educators are finding innovative ways to enable students to achieve the outcomes specified in the National Certificate modules -- including the use of long-term projects that span several modules. The required integration of core skills units with vocational units in the GNVQ framework seems to have great potential for encouraging interdisciplinary teaching.

Both countries are finding that competency-based standards -- that is, standards defined in terms of what students should be able to do -- tend to promote instruction that is interdisciplinary and project-based. Competency-based standards also allow for more flexibility in where and when learning takes place. Such standards that are explicitly based on what students will be expected to do in the world outside of school encourage the demonstration of competencies either in the context of real work applications or practical projects in school.

In both countries, unlike the U.S., there is a strong tradition of teachers as professionals, qualified to decide how best to enable students to achieve standards of competence. Under the on-going reforms in these countries, some excellent guidance materials have been produced by government agencies and awarding bodies. But in general, the strategy has been to let schools and teachers figure out how to achieve the goals themselves, on the principle that the many problems that will arise are best worked out "in the field," rather than in a central office.

This strategy will not bring about changes quickly. The Scots have been experimenting for over a decade with using interdisciplinary, project-based instruction to help students achieve competency-based standards, and still these practices are by no means universal in Scotland. While this approach makes for slow change, it may well result in more lasting change, since

teachers will convince themselves, not be told by others, what works in helping students to learn better.

- *Provide training and support to teachers exploring new ways to help students achieve the standards.*

If the experience of the Danes and British is any guide, much of the support needed will be in the way of administrative support at the school level, for example, to rearrange schedules to accommodate project teaching and free time and space for teacher teams to meet.

Teachers will also need extensive, on-going training. The experience of the Danish Metalworkers' "Metalworking in the 90's" program suggests that teachers would benefit from training in techniques for project planning and management.

- *Don't let the urge to "cover the material" get in the way of rich learning experiences.*

An articulate case for this position was made by the training manager quoted above, who argued that schools should be more concerned about what students are able to do than what they know and, therefore, should encourage projects and other approaches to teaching that help students develop process skills, not just content knowledge.

ASSESSMENT

1. How is the performance of learners assessed and documented?

Main issues of interest to the team:

- How to use assessment not only to measure learning but also to motivate it;
- How best to measure and document the progress of the learner over time.

DANISH APPROACH

The Danes assess the performance of students in vocational programs through a combination of on-demand and embedded assessment. The approach to assessment differs markedly between the first year of vocational education and the last two years, where assessment follows the more traditional approach. This difference stems from the fact that standards for the academic part of vocational education, which is concentrated in the first year of a student's training, are separate from those for the practical part, which begins in earnest in year two of most vocational programs.

Assessment in Year 1: Culminating Academic Exam

The push in the 1991 reform for greater academic rigor resulted in more required courses in mathematics, science and languages and a culminating exam of academic subject matter that is taken after the required courses are completed. Most students take the exam at the end of their first year, so they can devote full time to practical learning during the succeeding years. Some of the vocational teachers we spoke with complained that this new arrangement cuts into their ability to do much in-depth practical learning in the first year, not only because of the greater load of academic courses students must now carry, but, in the words of one instructor, "the students start cramming for their exams in April; after that it is impossible to get their attention."

The exam consists of a written and an oral part. The written test is developed by the Ministry of Education, which commissions teachers from around the country to write the questions. All students in the same family of occupations take the same test. The tests are secure, so that even the teachers are not permitted to see the questions in advance. The teacher leaves the room during the exam. Afterward, the teacher makes a copy of the exams and sends the originals to another college for grading by a teacher there. One of our team members pointed out that, perhaps in a small way, this practice contributes to "norming" of performance standards, since it enables the teacher doing the scoring to see the quality of work done by students of another teacher.

The oral test is developed locally. It is carried out by the teacher and a colleague from another school. Students pick questions prepared by the teachers out of a hat and have twenty minutes or so to prepare their response.

We got conflicting messages about how important these exams are. Some of the students we spoke with seemed concerned that if they failed the tests they would be dropped from the program. Teachers and administrators indicated that the exams do not carry such high stakes. Certain of the companies we visited do look at how well a student has done in school in Danish and mathematics especially; but they placed much more weight in making selection decisions on the interests and aspirations of the applicants. The primary purpose of the written exam especially seems to be to motivate students to take their first-year academic courses seriously.

Assessment in Practical Training: Continuous Assessment of Competence

Assessment during the "sandwich" phase of the programs, when students do alternating stints in the school and the workplace, is much more embedded in the daily teaching and learning process. As one team member observed:

> "Assessment is so continual and so built into the process and so tailored to the way an individual student communicates his or her competence. These kids have so many ways to demonstrate that they can do this work and that they can achieve."

An important tool for monitoring the apprentice's progress during this period is a log book that the apprentice takes back and forth between school and workplace. In this log, the teacher and workplace mentor record the major tasks that the apprentice has undertaken toward meeting the standard and rate the apprentice's performance on each task. They also make general comments concerning the apprentice's behavior and indicate any need for follow-up. A mentor at Radiometer told us that "if a teacher thinks that a student needs work on a particular skill, he will indicate that in the student's log and we will provide additional instruction as necessary." Exhibit 17 is a sample page from such a log. At the end of each school stay, the apprentice's teachers fill out an evaluation in which they assess the student's progress during the period and evaluate the success of their teaching in helping the student make this progress. A sample of such an evaluation form is given in Exhibit 18. The log allows the teacher in the school and the mentor in the workplace to keep close track not only of the apprentice's progress, but of what the other is doing. The best teacher or mentor will adapt what he or she is teaching to reinforce what the student is learning in the other's domain.

Teachers and mentors also communicate directly with one another as necessary about an apprentice's progress. The several mentors we asked said that they are in frequent contact with teachers at their apprentices' technical colleges. Most added that they would have no hesitation contacting a teacher were an apprentice having difficulties.

Some companies do their own periodic evaluations of their apprentices' progress. One company we visited, Danfoss A/S, a manufacturer of metal valves and other specialty products, evaluates its apprentices every three months. The evaluation is carried out by the apprentice's sponsor (i.e., mentor), who assesses the apprentice on the following dimensions:

- Professional (i.e. technical) skills
- Ability to learn
- Methodical and careful
- Well-roundedness
- Cooperative
- Enterprising and independent
- Productive.

Another company we visited, Radiometer A/S, a manufacturer of medical testing equipment with 4,000 employees (making it a fairly large company for Denmark), evaluates its apprentices along similar lines using the sophisticated performance evaluation system it uses with all of its employees. The Radiometer system was particularly impressive in that it ties the skill development plans for each employee to the strategic business plan for the company.

Companies such as these take seriously the assessment of "soft skills," which are seen as every bit as important as technical skills and knowledge. This view is reflected in a comment by a mentor at Radiometer.

> "A youth apprentice can fail on social behavior. If he cannot work as a member of a team, he will not succeed in today's workplace and therefore will not have what it takes to be a journeyman."

The Journeyman's Examination

The culmination of an apprentice's training is the journeyman's examination. During the final days of the last school period, the apprentice is asked to undertake a project. An apprentice in machining, for example, might be asked to produce a "master piece." An apprentice in electronics might be asked to troubleshoot a system into which faults have been introduced.

On the last day, two outside examiners come to the school to evaluate the apprentice's work. The examiners always consist of one representative from labor and one from industry. Examiners are chosen by the trade committees according to set rules designed to avoid patronage. The 1991 reform law now requires that examiners undergo training to ensure reliability of judgments. They are required to meet ahead of time to review the assignment the apprentice has been given and agree on the criteria for judging how well the apprentice has done.

The examiners follow an agreed-upon script in asking the apprentice about their work. We were told that examiners are as much concerned about the process by which the apprentice carried out the assigned task as with the quality of the final product, and so will ask the

apprentice to reflect on how the work was done. Jørgen Andersen of the Metalworkers Union said that while older examiners tend to focus on technique, younger ones will base their evaluation on "soft skills" as well -- how well did the apprentice present his work, how articulate was he in answering questions, how good a job of planning and trouble-shooting did he do? This is being encouraged by the trade committees and the recent reform law. The teacher is present during the examination, and may take part in questioning the apprentice, but the final decision rests with the outside examiners.

The 1991 reform law mandated that the journeyman's examination include a theoretical as well as a practical part. The apprentice's teachers write the questions for the theoretical part, usually on a topic different from the one covered in the practical exam.

Only about two to three percent actually fail the journeyman's test. In the rare instance that an apprentice does fail, the company, not the school, bears the brunt, since it must bring the apprentice on at a full journeyman's wages and provide tutoring and support to prepare the apprentice to retake the exam. No one fails on the second try.

The journeyman's exam is not a make or break test. There are no surprises on the exam. By the time the apprentice takes the exam, he or she has done similar work many times before, and is thoroughly familiar with the tools and systems he or she must deal with on the exam. We spoke with apprentices who were preparing for their examinations in electronic mechanics (machine control). They did not seem to be overly anxious about the impending exam. In fact, they said that they were much more concerned about getting a job once they passed the test, since there are few openings in this field.

Key Principles

Underlying the practice of assessment in Danish vocational education, and especially the assessment characteristic of the practical or "sandwich" phase, are a number of key principles that are worth highlighting here.

First, the approach to assessment assumes the presence of persons who can judge what quality is, that is, who have internalized the standards. Because this approach to assessment relies heavily on the judgment of the teacher in the school and the mentor in the workplace, it requires a deep understanding of the standards by both so that they can recognize whether or not a student is performing up to standard. As one team member noted, "The key in the Danes' approach to assessment to ensuring that their judgments are reliable is not tests and statistics, but the grounding of those responsible for teaching and assessment in what the expectations are for students."

The teacher in the Danish technical school is well informed about what is expected of students because he or she is included as a member of the community of practice in which these standards are set. The teacher (at least the "practical" teacher) is a skilled craftsman, having come through the apprenticeship system. The teacher is also a member of the local trade committee, and teachers are represented on the national trade committees. Most teachers

spend an average of a week each year in industry in an effort to keep their skills current, and they communicate regularly with colleagues in industry.

Second, assessment is ideally a continuous process embedded in the teaching and learning process. The most important assessment takes place daily through an on-going process of monitoring of student growth. It depends on continual communication, at one level, between the teacher and student, with the teacher providing feedback and encouragement to the student, and, at another level, between the teacher in school and the mentor in the workplace, to ensure that continuity of teaching and judgment is maintained.

Culminating assessments are treated not as checks on student learning or as gatekeepers, but as an affirmation of achievement by the learner. The journeyman's examination in particular is a rite of passage, in which those who have been responsible for the apprentice's development all along affirm that the student has met the standards.

There is a distaste among teachers for tests that seek to check whether students have "mastered the material," especially since this is viewed as an abrogation of the authority of the teacher as professional. As one team member noted,

> "Generally, the teachers we talked to are not real crazy about testing. Any time there is an external test, they see it as a distraction that they just as soon would rather not have, because of this general consensus among teachers/instructors that 'I know a good product when I see it, trust me to test it and to see if it is there or not rather than having it mandated from the Ministry of Education or anyone else.'"

We heard a similar sentiment expressed at COTAS, a small electronics firm we visited that had succeeded in undertaking the organizational transformation necessary to get ISO 9000 certification, with dramatic results in terms of increased productivity, improved responsiveness, and general alleviation of stress. According to COTAS's managing director, under ISO 9000, the company no longer double checks work; this is a major departure from past practice, where inspectors were assigned to check workers work.

> "Now every unit, every worker is responsible for the quality of their own output. It is amazing how much people start to improve quality when there is not someone looking over their shoulder always."

Third, assessment should be used not to sort or shut out students, but to show growth and guide and encourage them in further learning. Apparently this principle pertains to other levels of Danish education, especially in the compulsory school, or Folkeskole, where sorting of students on any basis is avoided. According to a teacher at Århus Technical College,

> "One principle of the Folkeskole teacher is not to focus on the brightest students -- that would be considered morally wrong; rather the teacher's job is to bring all students in the class to perform at a satisfactory level."

To bring their students up to standard, Folkeskole teachers use continuous assessment. There are no grades or report cards. Instead teachers meet with students monthly one-on-one to discuss their progress. Teachers have conferences with parents three times a year. At the end of the ninth year, all students take an exam, which consists of a written part, prepared by the Ministry of Education and taken by students nationally, and an oral part, prepared by the students' own teachers. This is not a high stakes examination, since entrance to the gymnasium is based on recommendations from a student's teachers.

Danish youngsters attend the same school from grade one through grade nine. One or two teachers, typically the Danish and history teachers, stay with a class of students for the entire nine years. Other teachers usually spend at least two years with a class, so the teachers know their students very well. At the end of ninth grade, a student's teachers get together and made a recommendation, that the student is either 1) "qualified" to go on for study at the gymnasium, 2) "possibly qualified" for the gymnasium, or 3) "not qualified." Even this recommendation is not final, since a student whose teachers have recommended as either "possible qualified" or "not qualified" can still get into the gymnasium by taking a special entrance exam.

We were told that studies have shown that the teacher recommendations are reliable predictors of success in the gymnasium. In the United States, where tests are heavily relied upon for sorting students and deciding entrance to selective programs, there is a great deal of concern that such tests be fair. As a result, American education has devoted enormous energy to developing tests that can be scored reliably and cost effectively -- so we can get the most tests for our money. When we asked Danish educators how they ensure reliability of the assessments they make, we were met with blank stares.

Reflecting on what we had seen in Denmark, we realized that the fairness and reliability of assessments are non-issues for the Danes because they don't use tests in making important decisions about students, but rather rely on the judgments of teachers. How can they be sure that these judgments are reliable, valid and cost effective? The Danes consider them to be reliable because they are based not on a single judgment, but on the judgments of many teachers and mentors who have known the student for a long time and who have assessed and guided the student's progress in an on-going way. The judgments are valid because they are made by persons who understand the standards. And they are cost effective because the assessment is not some intrusive test designed by outsiders, but is built into the process of teaching and learning.

British Approach

The systems of vocational qualification that were initiated in Great Britain during the 1980s all follow the same basic model of assessment. In this model, evaluation of individual performance relies primarily on assessments done internally by teachers or trainers in the place where instruction is given. There has been a corresponding reduction in reliance on externally-set examinations, which were commonly used in earlier vocational qualification schemes, and are still the dominant form of assessment for academic qualifications. The

quality and consistency of internal assessment practice is monitored and improved through a process of "verification" or audit managed by the bodies that award the qualifications. This section summarizes our findings with respect to methods for assessing individual performance. The mechanisms for ensuring the quality of assessment practice are the focus of the next section.

The Assessment Model in More Detail

The purpose of assessment in the systems of vocational qualification now under development in Britain is to provide evidence that the learner has met a standard. All standards are specified in terms of competence, or the ability to do something or produce some outcome, and include "performance criteria" that indicate the level or quality of competence that need to be achieved to meet the standards. The general approach to assessment used under these schemes, then, is criterion-referenced as opposed to norm-referenced.

The heavy reliance on locally-developed assessment by these systems means that a great deal of latitude is given to the assessor -- whether it be the teacher in the college or the trainer or supervisor in the workplace -- to decide what evidence to use in assessing a candidate's competence and to choose the methods by which this evidence is generated and documented.

The range of methods that can be used for assessment under the NVQ scheme is shown in Exhibit 19, which illustrates the NVQ assessment model. Since NVQs are intended to signify competence in work skills, assessment for NVQs typically includes observation of a candidate's performance in the workplace. Other approaches are acceptable as well, including oral questioning, written tests, and even documentation of evidence of prior learning.

In the GNVQ system students are required to take a final, externally-developed exams upon completing a series of curriculum units, although formative assessment is left to instructors. In contrast, SCOTVEC has eschewed the use of final exams with the National Certificate (and GSVQs), preferring instead an "additional assessment," which is essentially a project or assignment requiring the learner to make use of learning across their entire program of learning. Still, it is up to the assessor to design the assessment. Exhibit 20 shows the many methods available.

With the exception of GNVQ final exams, which are paper and pencil tests, all three schemes -- NVQs, GNVQs and the National Certificate -- have a clear preference for performance assessment. Assessments that measures one's ability to put knowledge into action lend themselves well to systems of qualification such as these that are based on standards of competence, that is, the ability to do something or produce some outcome. Performance assessments are relatively easy to set up in the workplace, where the tasks and projects of everyday work can be used as situations through which a person can demonstrate competence. These sorts of situations do not occur naturally in the classroom; they need to be created. Yet most teachers are not trained or accustomed to engage students in purposeful projects that can both develop and demonstrate competence. Assessing in this way requires a change in teaching.

In the GNVQ and SCOTVEC National Certificate programs, which are largely delivered in colleges or schools, efforts are being made to encourage teachers to move in this way. For example, the guidance materials on assessment put out by SCOTVEC for use by teachers at further education colleges urges the use of assessments that involve students in the performance of practical projects in which some substantive product or outcome is produced.

In our visits to further education colleges in both England and Scotland, we did see examples of long-term projects being used as means of assessing student mastery of outcomes as well as of providing vehicles for student learning. At Cardonald College, long-term projects are used to assess outcomes specified in not one, but a series of modules. Also, we were told that in order to complete the requirements for Higher National Certificate units in engineering-related disciplines students must carry out substantive projects in addition to passing exams in order to pass a given module. Students in these programs also are required to carry out a capstone project, which is judged by a panel from industry, as a culmination of their course of study. How widespread the use of performance assessment is, we cannot say for sure. We got the impression that, in the further education colleges of Scotland especially, there are at least pockets of expertise and that this expertise is spreading, encouraged by the awarding bodies.

The results of assessments for each student are compiled in a "portfolio of evidence," which enables the student to document his or her progress. NVQ candidates are also required to maintain a log, much like the log kept by the Danish apprentice, in which the candidate's supervisor indicates which competencies the candidate has demonstrated. The portfolio of evidence accompanies the log book as documentation of the accomplishments recorded in the log.

The portfolio of evidence will be a central feature of the GNVQ, as well. Most of the evidence that will go into a student's portfolio will be generated through assessments developed by his or her teacher. However, students will be required to pass externally set tests at the end of each of the mandatory units. The government imposed this requirement, apparently with the intent of ensuring that students have covered the necessary content. According to the people we met at the Employment Department, the tests in their current form are designed primarily to elicit "forced answers." BTEC, one of the awarding bodies, had offered a precursor to the GNVQ that was based only on internally-developed assessments. BTEC opposed the mandated externally-set tests on the grounds that they will monopolize the attention of teachers and students and compromise the benefits for learning of more embedded forms of assessment.

Belief in the salutary effects for learning of embedded assessment (and corresponding belief in the deleterious effects of externally-set tests) was a key feature of the Scottish Action plan, which, as has been mentioned, was the blueprint for the current system of vocational qualifications in Scotland. Thus far, the Scots have resisted returning to the use of external exams for vocational qualifications. Such tests remain a prominent feature of academic qualifications, however, because they are seen as more reliable and they offer relatively inexpensive sorting mechanism for use by universities in admissions. In a recent report that is likely to influence government policy, the Howie Committee, which was commissioned by the

government to examine the structure of post-compulsory level education in Scotland, recommended that vocational qualifications be based on a mixed mode of assessment, with both externally and locally-designed assessments. According to Sheila Clarke of the Scottish Further Education Unit, the Howie Committee favors this approach at least in part on the grounds that it would "assist the parity of esteem between academic and vocational qualifications."

The Model in Practice

To be certified as an NVQ assessor, a person need only be technically competent in the area of competence to be assessed. This helps to ensure the validity of assessment, but it causes problems for reliability. In fact, recent studies by the Employment Department indicate that there are "some indications of problems with reliability" of NVQ assessments. This comes as no great surprise in light of the fact that in the NVQ system, the assessor tends to be the candidate's supervisor at work. Such individuals are not likely to have a great deal of familiarity with the standards, much less with methods of assessing performance against the standards. Assessors are given a single day of training on topics including: familiarity with the units and elements of competence; designing assessment situations; and providing helpful feedback to the assessee. We were assured at the Employment Department that the recently released U.K.-wide standards for assessors would help to lessen the problems of reliability, especially as training of assessors is adapted to reflect the new standards.

From the standpoint of the team, a more fundamental problem for reliability of assessment under the NVQs is the reliance on a single person to make the assessment. It is hard to see how reliability can be ensured, no matter how well specified the standards or the procedures for assessment, if the assessment rests primarily on the judgment of a single assessor without the moderating influence that comes from having multiple assessors who are able in some way to come to a consensus about the final judgment of whether a standard has been met. In the Danish model, for example, the apprentice's performance is assessed through many observations by the mentor at work and the teachers at school, who communicate their individual judgments on the student's progress either indirectly through the apprentice's log or directly, and thus move, over time, toward a reliable judgment of the apprentice's performance. The approach of relying on a single assessor also diminishes the potential of assessment to serve as a learning experience, since the candidate only has the benefit of a single perspective on their performance.

Problems of reliability are even more acute when the standards against which performance is assessed are broader rather than relatively narrow, occupation-specific skills that characterize the NVQ standards. This is the case with the GNVQs and Scottish national certificates. Achieving reliability in assessments was the source of much difficulty for the 100 or so schools and colleges involved in last year's pilots of the GNVQs. In particular, most sites had difficulty getting agreement about where a particular student's work fell on the levels of performance specified in the performance criteria. According to an Employment Department staff person who oversaw the pilot work, "You've got to know the descriptors and performance criteria very well to get it right," suggesting that a lot more needs to be done to

increase teachers' understanding of the standards. There was a strong realization that this process is going to take a long time. "We haven't gone far down this road," said an Employment Department official.

The Scots have had the most experience with locally-developed assessment, having made it the basis for vocational qualifications in the decade since the Scottish Action Plan. According to Sheila Clarke of the Scottish Further Education Unit, the benefits that have been reaped through this approach include:

- Teachers and trainers have a clearer understanding of what is to be learned;
- Use of formative assessment as an integral part of teaching has been strengthened;
- Assessment is more integrated with teaching and learning, and some of the unfair pressures of external testing have been removed.

Still, the Scots are very much in the learning phase with this approach to assessment. A 1991 review of the Scottish vocational qualification system by the Scottish Office Education Department reported that:

> "The greatest single negative influence on learning and teaching was caused by the manner in which staff interpreted assessment requirements. In some subjects the dominant approach was to teach each learning outcome discretely. This led to a fragmented learning experience, and sometimes trivialized it. There is a need in some subjects to devise assessment approaches which are more sympathetic to the learning process; such approaches would either be integrated with the learning activity, or be more holistic, assessing a number of outcomes through one instrument. SCOTVEC has encouraged innovative approaches to assessment and should continue to do so. Further encouragement should be provided through the curriculum and staff development activities of colleges and regional and national agencies." (Cited in Clarke 1992)

Teachers are having trouble adapting to new approaches to assessment because it requires not just that they learn new methods of testing, but that they teach in an entirely different way. According to Sheila Clarke, teacher training and qualifications have not kept pace with changing practices of assessment and teaching.

SCOTVEC has produced some excellent training materials on assessment (as have the awarding bodies based in England). Still, these materials and the standards for assessors emphasize procedures. While guidance of this sort is necessary, some of those we met in Scotland suggested that there is an increasing awareness of the need for assessors to discuss actual examples of students' work to ensure consistency of judgment and build understanding of the standards. As will be discussed in the next section, the further education colleges are in

the process of establishing procedures for internal verification of assessment, which in some cases at least include internal review and discussion of assessed work by teachers at the college.

LESSONS FOR THE U.S.

- *Resist an over-reliance on "end of course" and other on-demand testing.*

> "In the school where I was in the United States, there were many more tests, too many tests. You have to study very, very hard. There was much stress. But after you take the test you can forget about what you learned."
>
> -- Student, Århus Technical College

This was the response of a Danish student in his first year of vocational training who had spent a year as an exchange student at a high school in Richmond, Virginia when we asked him: "What is the biggest difference between school in the U.S. and in Denmark?"

When we mentioned this to one of his instructors at the technical college, the teacher smiled and said:

> "Yes, we have had several instructors who have been trained in the U.S. And we get the same thing from them: test, test, test, all the time. We say to them, 'No, no, no, this is not what we do here. If we are testing all the time, we are taking responsibility away from the student. Our job is to give responsibility for learning to the student.' This is very important for a young person who will enter my field [electronics], because an electronics technician is always finding new problems to solve in his work, always doing new things. If the student does not know how to learn, then they are of no use when they go on the job."

This principle of giving responsibility to the learner as a means of motivating learning was also reflected in the practices of the high performance companies we visited. The rejection of "double checking" by COTAS, the small Danish electronics firm that had earned ISO 9000 certification, was mentioned above. In relating the reasons why the company decided to go for ISO 9000 certification, Ole Riis Hansen, Managing Director at the firm, told us that:

> "Our company's sales have grown considerably since it was founded 15 years ago. In the mid-1980s, the company expanded from 22 to 45 employees. I and my two partners assumed that because it was a small company, we had a handle on what was going on. But we discovered that things had gotten away from us. Everyone was constantly rushing around to keep up with the fast growth in the business and the need to always develop new products and innovations. We were all very stressed."

The results of the changes COTAS has made -- including no longer checking over the workers' shoulders and instead giving responsibility for quality to everyone -- have been "amazing," according to Hansen,

> "We are much better able to keep up with the demands of fast-paced work. Everyone knows what to do, and there is no more stress."

At Radiometer, another Danish electronics firm that is a world leader in the production of blood testing devices, we noticed the presence of optical scanning devices on every assembly worker's station, an indication of the firm's policy to give responsibility to the worker. In ticking off some of the most promising human resource development practices used by his company, Ian Muir, a forward-thinking training manger at GEC Marconi in Scotland, told us that one of the most important was the increasing reliance on self-assessment by workers and assessment by peers. At United Distillers in Scotland, which has adopted a total quality approach to managing its operations, workers and foremen have more shared responsibility, making decisions that affect the day-to-day operation of the plant.

It only makes sense that an education system that aims to prepare young people for employment in high performance (and therefore high wage) companies such as these should apply to its modus operandi the fundamental principles that underlie practice in such firms.

- *Advocate assessment that is embedded in the teaching and learning process*

On-demand tests intrude on the learning process and discourage students from taking responsibility for learning. On-demand tests that are externally set are perhaps even more disruptive because they reflect a distrust in the teachers' judgments. Assessment that is an on-going part of the learning process encourages students to take responsibility for learning and gives more authority to make judgments to those who are best positioned to evaluate a student's progress: his or her teachers and mentors.

There was a general consensus among members of the team that a student log, like the ones used to monitor the progress of Danish apprentices in the school and the workplace, is a powerful tool for continuous assessment. As is the practice in the British NVQ and GNVQ systems, such a log could be a key part of a "portfolio of evidence" that every student would keep to document what they have achieved and what more they need to do toward meeting the standards. All of us liked the portfolio of evidence concept, in part because it places responsibility for evaluating learning and growth on the learner, with the teacher or mentor serving as coach.

We think that there is much of practical value to be learned from the experimentation with continuous or embedded testing that has gone on in Britain, with Scotland taking the lead, over the past decade. The British have produced a series of excellent guidance pieces on alternative assessment that could be used as models for American educators seeking new

approaches to assessment. One example is "The National Certificate: A Guide to Assessment," put out by SCOTVEC. In general, we suggest that American educators keep an eye out for any new developments in the area of assessment coming from the British Isles.

- *Encourage schools to involve members of the community in assessing students*

The journeyman's examination may be in effect a rite of passage, but the fact that representatives of the partners come to the school to judge the apprentice's work carries important messages for the student, the teacher and the school.

Schools and colleges in the U.S. should take advantage of the expertise and interest of members of the community by involving community members in assessing student work. This would make especially good sense when the work to be judged involves a long-term project -- for example, a capstone piece of work by older students -- or portfolios of students' accomplishments over time.

This practice would have a number of benefits. The presence of outside judges would encourage students to do well and give teachers an incentive to ensure that their students excel. If well run, the experience could be more than just an assessment, but could provide opportunities for learning by student and teacher alike. As in the examination of the Danish apprentice, outside judges could help students gain insight into their work by asking questions that encourage students to reflect on how they did what they did, where they made mistakes, and what they learned from their mistakes. Teachers would benefit by seeing the standards against which outsiders judge their students. This practice would provide a more direct and strategic way for employers and other community members to contribute to student learning than is the case in most school-community partnership programs today.

- *Provide training and support to help teachers learn new methods of assessment; but don't expect quick results.*

In 1983, the Scottish Action Plan set forth a bold vision of a system of assessment for vocational education based not on external exams but on assessments developed locally by the teacher or trainer who provided the instruction, assessments that ideally would be embedded in the teaching and learning process. Ten years later, much has been accomplished, but there is still a long way to go before there is a level of comfort with this approach throughout the vocational education system. While there has undoubtedly been resistance among teachers and trainers to make changes, the main reason that it has been so difficult to spread is surely the magnitude of the changes it requires in practice. For this new approach to assessment to be effective in benefiting learning, it needs to be accompanied by thorough changes in teaching.

Heeding this lesson from the vanguard work in Scotland, the Scots and the British generally are taking steps to help teachers make the changes in practice necessary to accommodate new approaches to assessment. In particular, they have produced a wide range of training and

guidance materials that seek to clarify the standards and delineate procedures for assessment. Any effort that would hope to succeed in the United States would have to at least match these materials in quality.

Still, the British are coming to realize that training in assessment procedures is not enough; that to come to a true understanding of the expectations set for students by standards and to make reliable judgments of student performance against such standards, teachers need to be able to examine and discuss with other teachers actual samples of student work. This discussion of student work needs to be incorporated as an integral part not just of teacher training, but of the everyday practice of teaching. The British are experimenting with ways of doing this through procedures for internal verification of assessment (which are discussed in the section that below).

▸ *Give teachers opportunities for professional development that help them gain a clearer understanding of what students need to be able to do to succeed.*

Having clearly stated standards of what students should be able to do to prepare for productive roles at work is a critical first step to enabling teachers to make reliable assessments of their students. Teachers in the vocational education systems of Denmark and Britain have clear standards to guide them in making assessments. Teachers in this country do not. They have to rely on indirect signals from textbooks, standardized tests, and packaged curricula. In setting such standards in the U.S., it will be important to involve teachers as active participants in the process.

However, for teachers to understand what is expected of students in the workplace outside of school, they need to have on-going exposure and contact with that world. One way to help teachers make the link is to involve professionals from outside the schools in related disciplines and fields in assessing their students' work. Teachers would also benefit from working directly in related fields through internships and sabbaticals. The "practical teachers" in the Danish vocational education system spend an average of a week each year working in industry in their fields. The British are investing considerable sums to create similar opportunities for their teachers, including academic teachers.

Still another way to improve the understanding among educators of the expectations of the "outside world" for students is to encourage people to enter teaching who have experience outside of education.

2. How is the quality of vocational education programs monitored and improved?

Main issues of interest to the team:

- How to ensure accountability of vocational schools and programs in systems where responsibility for assessment is primarily local;

- How to structure accountability systems to promote continuous improvement in the system.

DANISH APPROACH

The quality of Danish vocational education is controlled through the same structure through which standards for the system are defined and updated. The mechanism for monitoring system quality is continual communication among parties involved in the structure at all levels with a focus on improving the capacity of the system to prepare skilled workers.

An important vehicle for this kind of communication at the local level is the apprentice, who in going back and forth between school and workshop, serves as a kind of feedback mechanism. When this "intermediate product" is not satisfactory coming from one side or the other, the other is alerted and steps are taken to remedy the problem.

Another interesting instance of the use of the apprentice as an "instrument" for monitoring system quality is the practice -- evidently fairly common -- of sending apprentices for training stints in other countries. Beyond the advantages to the student, this practice allows the Danes to determine whether their own system is up to the standards of the training offered in other countries -- in essence, to engage in international benchmarking of standards and practice. Evidently this practice also encourages technology transfer. An employer association representative told us about a group of Danish construction apprentices who, after a training stint in the U.K., brought back with them methods that they convinced their Danish employers were superior to the ones they had been using.

Danish companies involved in vocational education seem to keep very close tabs on the quality of the technical college programs in which their apprentices are enrolled. Some companies conduct periodic reviews of these programs. For example, a foreman at Radiometer told us that after a recent visit to a machining program at a local technical college, he and his colleague recommended to the college that it broaden the focus of the training in the program from the machining of discrete parts to production as a comprehensive and continuous process. According to a training manager at Danish Railways Workshop, larger companies send apprentices to different colleges in an effort to "shop around" for the best programs. This has the beneficial effect of encouraging competition among the colleges.

And, of course, skilled workers frequently go to the colleges to judge journeyman examinations as representatives of the partners, a practice encouraged by their companies. Some skilled workers travel all around the country judging these exams, which gives them a good basis for comparing the quality of programs. Skilled workers as well as instructors from the technical colleges, also make up the membership of the local trade committees, which advise on technical college programs in their field. The local trade committees are represented on the Council for Vocational Education, which facilitates the flow of information about problems and innovations on the local level to the national level where the goals and broad

frameworks for the system are set. Communication from the top down builds a common understanding of the standards and ensures that the national standards are consistently applied throughout the system.

In addition, the partners have a direct handle for holding the technical colleges accountable through their representation on the governing boards of the colleges. The 1991 reforms sought to increase competition among the technical colleges. The colleges are now considered to be self-governing institutions, but the bulk of their funding comes from the national government based on the number of students they enroll. Hence, the colleges have an even greater incentive to satisfy the needs of their customers: the partners and the local community.

BRITISH APPROACH

In Britain, there is not, as there is in Denmark, a history of cooperation among business, labor and education that supports on-going communication among the various parties at various levels aimed at monitoring and improving the system's capacity to turn out well-trained workers. Lacking such an infrastructure of established relationships, the British are having to create by bureaucratic means a system for ensuring the quality of vocational education.

The key challenge for developing systems of vocational qualification in Great Britain is how to create mechanisms for ensuring that national standards for qualifications are being consistently applied in systems where control over methods of teaching and assessment is primarily at the local level. The British evidently believe that the standards and procedures for quality control themselves need to be applied on a consistent basis nation-wide, since they have secured agreement by the various awarding bodies to follow the same, comprehensive approach to quality assurance. The main features of this approach are:

> *Validation of Awards* - Ensures that standards are clearly reflected in each award.
>
> *Training and Certification of Assessors* - Ensures that assessors are qualified to carry out assessments according to recently-released national standards for assessors and verifiers.
>
> *Approval of Centers* - Checks the capability of new "centers" where instruction and assessment would be provided to support candidates from enrollment to qualification.
>
> *Verification* - Ensures that procedures for assessment are being consistently applied and assessors are working toward the same national standards across centers.

It was evident to our team that these mechanisms could well be used by the national awarding bodies as instruments for enforcing quality in a top-down manner. However, there seems to be widespread consensus in Britain that this is not the way to go, in part because it would reduce the flexibility of the system, but also because the resources are not available to support a regime of top-down control. The best a national system of quality assurance can do is to take steps to ensure that, at the local level where teaching and learning take place, the standards are

well understood and the tools of quality measurement -- in particular methods of assessment -- are being applied consistently and effectively. So that national involvement won't be perceived by the locals as threatening their autonomy, this has to be done with an attitude of support.

An innovative approach to accomplishing this is the system of verification now under development in Britain. This will be the focus of our analysis in the rest of this section, since we think that it has features that could be incorporated into a system for use in this country.

The verification process focuses on the assessment process in and across the "centers" where training and assessment for qualifications is provided. It has two dimensions:

> *Internal Verification* - ensures that all assessors within a center are making consistent judgment by following accepted assessment procedures.
>
> *External Verification* - ensures that assessors within a center are making judgments consistent with national standards.

Internal verification is carried out by a designated person within the center who serves as a combination of internal coach, critic and cheerleader. This internal verifier supervises the assessments carried out by his or her peers, reviewing samples of assessed work and providing training and support. The further education colleges, especially those in Scotland, seem to be ahead of centers located in business or community sites in providing support and quality assurance through internal verification. At least some further education colleges in Scotland have set up formal procedures for verification of assessment, including the standardization of assessment processes and internal reviews of assessed work. In certain cases, groups of instructors come together to re-evaluate student work that has already been assessed. This process of re-examining, discussing and then seeking to reach consensus on actual pieces of student work helps to build understanding among the teachers about what it takes to meet the standard.

In the external verification process, persons certified by an awarding body periodically visit each center where they conduct a one-day review of assessment procedures. Following a standard review process, the external verifier asks to see samples of assessments with student work, observes assessments in progress, and examines the operation of the internal verification system. Exhibit 21 is a report form used by external verifiers of qualifications awarded by SCOTVEC to put a "hold" on the certification by SCOTVEC of a particular award module. The "reasons" listed on the report suggest the kinds of criteria the verifier uses in making a review. Of particular concern to the verifier is the kind and quality of evidence used to decide that a student has met a given standard. Verifiers typically require that the samples of assessment and student work submitted for review include justifications of why the evidence presented warrants a determination that the standard has been met.

The centers tend to look upon external verification as an audit, a check by the awarding body to make sure the center is not doing anything in violation of standard procedures. According

to those at SCOTVEC, however, the awarding bodies see the purpose more as providing constructive feedback. From their perspective, the External Verifier is supposed to be not just a critic but a source of advice and support. We saw some evidence that this is the case. An Assistant Principal at Monkwearmouth College in Sunderland, England, told us that external verification is a painful process for the college -- particularly since it is necessary to persuade the external verifier of the value of the evidence used to judge actual student work -- but that in the final analysis, it is a useful one. At Vaux Breweries in Sunderland we were told by human resource staff that the external verifiers who have been sent to review Vaux's NVQ programs have all been people with experience in their industry, and that the feedback they have received has been quite useful.

At SCOTVEC, some concern was expressed over the difficulty of recruiting enough people from industry to serve as external verifiers for school-based programs. Of SCOTVEC's 470 external verifiers, 65 percent are educators and 35 percent are from industry. We did see evidence of the potential for a burgeoning cottage industry of freelance consultants who serve as verifiers. This may not be all bad, but it does not help to increase involvement of industry in assuring the quality of school or college programs intended to prepare for work in industry.

Of even greater concern is whether the system can afford to field enough verifiers to cover the growing number of qualifications and centers where vocational qualifications are offered. SCOTVEC estimates that it would need over 1,000 verifiers to have enough to do the work for every "cognate group" of modules -- this for a country with a population and land mass the size of Oregon. Not all of these would need to be full-time -- in fact, most verifiers work on a part-time basis, averaging around 15 days a year. Still, the resources required to finance this system are considerable, especially when one figures in the cost of training and supporting all of these people and ensuring that they are doing a quality job.

In fairness to the British, it was pointed out by members of our team who have had experience with systems of accreditation for professional and technical occupations and colleges and universities in the U.S., that these systems employ legions of external reviewers. Still, the business people we met with in Britain in general seemed uneasy about the level of bureaucracy involved in the British vocational qualification systems, both in terms of the high cost of financing "an army of verifiers," and the potential that the requirements of verification could be a drag on their efficiency.

Our sense is that, on balance, the British are taking the right tack to avoid over-bureaucratizing their approach to verification. They are doing this in at least two ways. First, they are keeping the focus of the external verification very narrow, confining it to the process of assessment, and in particular, the *evidence* that is used to determine whether or not a learner has met a given standard. The external verifiers do not spend their time calculating the student-teacher ratio or counting the number of books in the library, but instead focus on student work produced to meet specific standards. In other words, the verifiers check to see whether the program is truly producing the outcome it claims. This gives a great deal of

flexibility to the center, and the teacher in particular, to decide how to achieve the outcome. At the same time, it focuses attention on the standard, and thereby increases understanding among those who do the assessment of what it takes to meet the standard.

Second, in operationalizing external verification, the British seem to be stressing its potential as a mechanism for providing support, rather than for enforcing accountability. We liked the idea of a part-time external verifier whose purpose in evaluating a center assessment procedures is to provide constructive feedback and support to centers on how to bring their local judgments in line with national standards. However, assessor training should nonetheless involve practice with actual samples of student work -- otherwise the understanding of the standards remains abstract. This orientation of support encourages centers to use the results to rethink, through internal discussion and debate, what the outcomes are and how best to achieve them.

Fostering the discussion around outcomes and how to measure them is also the role of the internal verification, which is also an approach that appealed to us. We would guess that many businesses will not be inclined to adopt a system of internal verification, especially if it is ancillary to their regular procedures for training and performance appraisal. This gives us hesitancy about the capacity of the system to ensure quality in qualifications offered at business sites. Yet, internal verification seems to be well suited to the purposes and climate of an educational institution. The few further education colleges we visited seemed enthusiastic about building a process of internal verification.

Some further education colleges in Scotland seem to be recognizing the potential of local assessment of students as a key measure of institutional quality and of internal verification as a process for managing quality measured through student assessment. At least one college, the principal of which we met, is taking steps to make internal verification a key feature of the all-encompassing system for total quality management the college is now putting in place. If successful, this initiative could provide a model for building local capacity for quality assurance. This is certainly the direction that the British need to take (and seem to want to take) since they cannot afford, and industry will not abide, a top-heavy bureaucracy for quality control of vocational education.

The alternative to a verification of this sort is externally-set examinations. Those seeking to build the new systems of vocational qualification in Britain understand that external exams, especially of the conventional standardized variety, are inadequate for measuring performance in relation to standards of competence. In general, they have been steadfast in holding out against pressure from politicians, universities and the public to enforce accountability through externally-set, standardized exams.

LESSONS FOR THE U.S.

- *Don't let the drive for accountability overwhelm learning.*

> "In the U.S., we educators have been extremely successful in convincing the American public that tests as we know them are meaningful indicators of educational performance. Now we have to convince them otherwise. And that is going to be a hell of a task in this 'age of accountability.'"
>
> -- New Standards Team Member

The mechanism by which the Danes ensure the quality of vocational education is a continual communication among parties at all levels of the system that is focused on improving the capacity to prepare skilled workers. The Danes do not rely on external examinations for this purpose. Such examinations have little to offer in the way of useful information about the performance of a student, especially compared to the judgments of teachers in school and mentors in the workplace who observe the student's work daily over a considerable period and who themselves have a clear understanding of the standards.

The architects of the vocational qualification systems under development in Great Britain have also chosen, at least thus far, to resist using external examinations as a means of ensuring quality. They see such tests as incompatible with the basic structure of the systems they are creating, where authority for deciding how to meet broad goals embodied in national standards is given to those at the local level where instruction and learning take place. This decentralization of control is seen as critical to allowing the kind of flexibility and innovation characteristic of the vocational education in Denmark and other leaders in vocational education. External exams disrupt local authority because they represent a distrust of the judgments made at the local level. They also provide incentives to teach in ways that are not conducive to student learning.

Nevertheless, external examinations are still a valued feature of other segments of British education, especially in England and Wales. This may be changing in the wake of the disastrous introduction of the National Curriculum, a fiasco now blamed, at least in part, on an overzealous use of external tests. The National Curriculum led to a revolt among teachers in part because it required extensive batteries of external exams at ages 7, 11, 14 and 16, exams that crowded out opportunities for learning by students and undermined a strong tradition of professional autonomy among teachers. Some argue that the National Curriculum undermined the gains in student achievement that had been brought about by an earlier reform, the GCSEs, which departed from exams based on standardized written papers to assessments based on assignments designed by the teacher. Ironically, the success of the GCSEs provided support for reliance on external examinations in the National Curriculum. As one knowledgeable person told us, "In this country, when there is a rise in the level of achievement, it is assumed that the standards have been lowered."

In the U.S., external tests are still seen as the most effective way of ensuring that students and schools are performing up to standard. If anything, pressure for external testing has increased in recent years from politicians and members of the public eager to "hold the schools accountable."

If the goal of education is to enable students to take responsibility for learning, the system must practice what it preaches. A key lesson from our study of vocational education in Denmark and Great Britain is that we cannot hope to encourage students to take responsibility for learning if we are constantly giving them tests to see how much they have absorbed. And we can't expect teachers and other educators to take initiative to find better ways to improve student learning if we are constantly looking over their shoulders.

- *Consider an approach to quality assurance based on the best of the British verification system model*

The scheme of internal and external verification that is being developed as the main quality assurance mechanism in the emerging British vocational qualification systems has much to offer a model of vocational education in the U.S. The model is *not* that of the certification by professional associations characteristic of fields such as health care in the U.S., or that of the institutional accrediting bodies familiar to U.S. higher education. Rather, to avoid the patronage and parochial interests that characterize such bodies, a system of quality assurance for workforce education would have to be coordinated by a single national body that transcends industry or professional affiliations. In Great Britain, such a role is played by SCOTVEC for the Scottish vocational qualifications, and NCVQ for the U.K.-wide NVQ and GNVQ systems. Without such an umbrella organization in the U.S., it will be impossible to set national standards, let alone ensure that national standards are being met.

In the U.S., the quality of training programs is guaranteed through accrediting bodies. Currently, to receive and maintain accreditation, educational programs must meet accreditation standards, which, typically, are not based on outcome measures but instead on institutional characteristics that serve as proxies for quality, such as, credentials of the faculty, number of books in the library, duration of the course, course structure, content, etc. All of these bodies employ part-time accreditors to ensure that institutions meet these criteria, which bear a weak relationship to quality student outcomes.

In the model we envision, external verification would be focused on outcomes, and in particular on the evidence by which outcomes are assessed. This approach of verification would allow for much more flexibility over where and how learning takes place. Flexibility is constrained by accreditation systems common to the U.S., which focus on inputs and contents. One member of our team warned that, "The minute we in the U.S. start to say, 'make sure that they are also teaching such and such, and make sure that they do things this way,' that is when we start to get into trouble."

CONCLUSION

There is no question of the need for a coherent system for school-to-work transition in the United States. Many observers have pointed out that the U.S. is the only industrialized country without such a system. Lacking clear guidance on what it takes to succeed in the world of work, many if not most young people entering the workforce in the U.S. flounder throughout their late teens and early twenties, unable to find employment offering a decent wage and opportunities for advancement. What education and training they do pick up along the way does not prepare them for jobs in the most high performance workplaces, organizations that have transformed themselves to respond to the challenge of rapid economic and technological change and that require broadly skilled workers to run them.

The Danes and the British are struggling to adapt or create systems of education and training that will prepare workers capable of thriving in such high performance workplaces. We believe that certain features of the approaches to standard setting, assessment and quality assurance being tried out by these countries should be part of the "vision" for a cohesive school-to-work transition system in the U.S. These features include:

National Standards for Workplace Skills

- Set by industry coalitions that include all relevant stakeholders;
- Defined in terms of competence -- what a person should be able to do -- based on an analysis of the competencies that are be needed by workers in high performance workplaces;
- Couched in terms of broad frameworks with standards for "core skills" integrated with standards for technical competence.

Employer "Buy-in" of Standards Development and Training

- Cultivated at both the national and local level to build the "market" for standards and to make standards-based credentials widely recognized, valued and sought after;
- Targeted at ensuring that standards reflect the skills employers need and building on-going employer demand for workers trained to standards.

National Board to Oversee the Setting and Quality Control of Standards

- Reviews and approves all standards for technical education and training;
- Manages the external quality assurance of programs by auditing internal assessment processes;

Local Assessment of Student Performance

- Based on judgments of teachers, mentors and other adults, including members of the community, as well as peer and self-evaluations;
- Documented in a portfolio of evidence, structured according to the national standards, that is assembled by each student with guidance from teachers and mentors;
- Audited locally by panels of teachers who re-score samples of previously assessed student work.

External Quality Assurance

- Based on an audit of assessment procedures and evidence used to demonstrate competence from a representative sample of student work;
- Focused on ensuring fidelity of evidence to national standards;
- Aimed at providing guidance on, not control over, assessment procedures.

Training and Support for Teachers

- Empowerment of teachers to function within broad guidelines as self-directed teams;
- Training in assessment using actual samples of student work that illustrate benchmark standards of performance;
- Support from administrators for schedule changes, release time and the like to accommodate new approaches to teaching and assessment;
- Training in project planning and management and other skills as needed to help teachers succeed with new teaching and assessment methods;
- Internships in non-school workplaces and other professional development activities aimed at helping teachers get a clear idea of what their students need to be able to do to succeed in work and life beyond school.

If the U.S. is to be successful in educating a productive and prosperous workforce, the vision for reform must encompass more than the creation of a viable school-to-work transition system.

For one, we need to ensure that our basic education system provides the necessary foundation for programs designed to prepare young people for work. The programs we observed in technical colleges in Denmark and Britain seemed to us to be of similar caliber as some of the high quality technical training programs offered by our best community colleges. The only difference is that the majority of students in their technical college programs are 17 or 18 years old, whereas the average age of students in advanced technical training in U.S. community colleges is in the late 20s. Especially in Denmark, the need for remediation at the technical college level is low. Danish students leave the compulsory school at age 16 fluent in English, well-grounded in both applied and theoretical math, and having completed four years of laboratory physics.

Thanks to the superior preparation they receive in compulsory school, the majority of students in Denmark and many students in Britain are able to enter into high level technical training at an age when most of our students are still in high school. Unless we in the United States can eliminate this deficit -- that is, unless we can bring our students to a similar level of readiness by around age 16 or 17 -- our system of technical education and training will forever be "remedial" in comparison with that of other countries. This same realization led the Commission on the Skills of the American Workforce, in its 1990 report, *America's Choice: High Skills or Low Wages!*, to propose a Certificate of Initial Mastery (CIM). The CIM would be benchmarked to international standards of performance for 16-year-olds, though it could be earned at any age. A young person receiving a CIM would be assured that he or she is prepared to enter world-class technical and professional training or a world-class university preparation system.

Neither the Danish nor the British are satisfied with their basic education systems -- despite the advantages they hold over ours -- and major reforms are underway in both countries. While basic education was not the focus of our investigation, we did learn enough about the reforms underway in these countries to recommend that they be studied by American educators involved in the restructuring of basic education in the U.S.

Realizing the vision of a system of education in the U.S. that prepares young people to be high performance workers will require not only changes at the level of basic education, but a rethinking of our university preparation system as well. Both countries are making changes to their university preparation systems aimed at ensuring that young people educated in this way develop skills that meet the requirements of industry as well as academia. The move in academic education in these countries is also toward integrating theoretical and applied learning in teaching and building bridges with vocational programs to allow greater flexibility of choice by students.

In Denmark and Great Britain, we saw the promise of a standards-based system of vocational education and training that is successful in preparing for work in a global economy. Where the systems of these countries work best, a critical factor is the involvement of employers, whether through the training of apprentices, contributing to the development of standards or curricula, or using standards to improve employee satisfaction and performance. Employer involvement is no panacea. Employers do not speak with one voice and at times give

conflicting messages, for example, by advocating that education should focus on "employability and adaptability," but then hiring the classically trained, narrowly-proficient job candidate. As the final customer of workforce education and training, however, employers must play a central role in developing and sustaining a system of workforce preparation. Still, employer leadership should be cultivated in a way that facilitates communication and cooperation at every level of the system -- national, state and local -- between all stakeholders, including workers, educators and policy-makers. Our study of vocational education in Denmark and Great Britain has persuaded us that it is only on such a foundation of communication and cooperation that we in the U.S. can hope to build a system for preparing young people to be high performance workers of the future.

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APPENDIX

Study Team Members

The Standards Team was headed by ***Mr. Davis Jenkins,*** coordinator of the New Standards Project's Applied Learning initiative, a part of the Learning Research and Development Center of the University of Pittsburgh. A graduate of Princeton University, Mr. Jenkins is currently pursuing a Ph.D. at Carnegie Mellon University, where he is conducting research for a dissertation on human resource practices of U.S.-based Japanese manufacturing "transplants." Before pursuing graduate school, he worked for the Academy for Educational Development, an international consulting firm. His many assignments at the Academy included assistance to community colleges and small manufacturers on the design of "total quality" approaches to training for advanced production systems.

Ms. Susan Goldberger, a senior project manager for Jobs for the Future (JFF), coordinates the JFF health industry work-based learning initiatives. She is also responsible for program evaluation and is conducting a two-year formative evaluation of a health industry youth apprenticeship demonstration project. Ms. Goldberger has worked for many years as a health policy consultant to consumer and labor organizations in Massachusetts. The recipient of a national Pew Health Policy Fellowship, she is completing her doctoral studies at the Heller Graduate School at Brandeis University.

Ms. Samantha Guerry, the Associate Director of Policy and Programs for the Center for Learning and Competitiveness (CLC), was a principal manager of the Comparative Learning Teams Project. Her research and travel in Scandinavia and Europe investigating systems of education, training and economic development laid the ground work for the teams' visits. She works with international representatives from business, education, labor and government to implement CLC programs on a wide range of issues. Formerly, Ms. Guerry was the Program Director for the New American Schools Development Corporation, where she worked with America's leading corporations, practitioners and policymakers on dramatic, comprehensive reform of the K-12 education system. She has also worked as a communications and strategic planning consultant for corporate and national non-profit organizations.

Ms. Sonia Hernandez is State Director of Education Policy in Texas. As a chief policy aid to Governor Ann W. Richards, she helped to formulate a comprehensive legislation package known as the "smart jobs" initiative which was recently introduced by the Governor. Before joining the Governor's office in 1991, she was Vice President of the National Center on Education and the Economy where she directed the Center's initiatives aimed at restructuring the Rochester City School District. Concurrently, Ms. Hernandez was an adjunct professor at the University of Rochester. She began her career as an elementary school teacher and was Teaching Principal of Emma Frey Elementary School in San Antonio's Edgewood Independent School District. She is a board member of the National Board for Professional Teaching Standards and was named 1984 Hispanic Woman of the Year, Southwestern United States Region.

Dr. Martin Nahemow, Director of School to Work Programs at the Learning Research and Development Center, University of Pittsburgh, has a Ph.D. in Physics from the Polytechnic Institute of Brooklyn, and for 23 years was Fellow Scientist at the Westinghouse Corporation R&D Center. He is the author of numerous scientific publications and holds three patents. While at Westinghouse, Dr. Nahemow was active in the secondary science education programs of the Westinghouse Foundation. At LRDC, he has overseen the development by teams of teachers and employers from throughout Pennsylvania of the curriculum and teacher training for the Pennsylvania Youth Apprenticeship Program, a demonstration effort funded by the U.S. Department of Labor and the Pennsylvania Commerce Department to serve as a model for a national youth apprenticeship program. Recently, Dr. Nahemow received funding from the Sloan Foundation to produce a handbook and teacher training curriculum on using portfolio assessment in youth apprenticeship.

Mr. Wayne Neuberger, Assistant Superintendent for Assessment and Technology for Oregon's Department of Education, has played a key role in implementing the Oregon Educational Act for the 21st Century, an ambitious effort to improve the competitiveness of Oregon's workforce by raising standards for all students and easing the transition from school to work for young people not headed directly for college. In particular, his office has been responsible for translating recommendations from numerous task forces and hearings throughout the state into a list of outcomes standards for the certificates of initial and advanced mastery called for under the reform act. His office is now orchestrating the development of an assessment system to measure student performance in relation to these outcome standards. He has extensive experience in educational assessment, having served as Director of Research and Evaluation for the Beaverton School District then as Director of State Assessment for Oregon.

Mr. C. Gary Standridge , Director of Research and Planning, Fort Worth Independent School District, Texas, directed a two-year study of skills needed for success at work that was based on analyses of 3,500 jobs in over 300 companies and community organizations in Fort Worth. The data from this research showed that young people entering the workforce must be prepared to handle much more than the basics of reading, writing and math; they must be able to communicate effectively and think critically. These findings led to the creation of Project C3, a partnership of community, corporations and classrooms that is seeking to teach students real-world skills by connecting instruction in school with applications in the workplace. This multi-faceted initiative has been featured on national television and has been cited as an exemplary initiative by the U.S. Department of Labor, the National Alliance of Business and the American Business Conference, and other national and state organizations. He has received frequent invitations to speak to districts and states throughout the country that want to emulate the Fort Worth approach in their locales. He was an advisor to the U.S. Secretary of Labor's Commission on Assessing Necessary Skills (SCANS) and is currently a member of the Technical Design Committee for ACT's SCANS Assessment Project.

Ms. Bess Stephens is the Corporate K-12 Education Relations Manager for programs of Hewlett-Packard (HP). A twelve-year HP veteran, she assumed this role in the Government Affairs department in September 1989, when the company created the new position. Her responsibility is to bring strategic direction and leadership to the company's growing interest

and involvement in K-12 education. Since starting HP's K-12 function, she has led the development of the company's strategy for its education program, brought focus, leverage and impact to its existing activities and established several new initiatives. She also advises HP managers on education issues, serves as a consultant to HP people who are participating in partnerships and represents HP with educators, legislators, community organizations and trade associations.

Ms. Cheryl Fields Tyler, Director of Workforce Excellence for the American Electronics Association (AEA), oversees all of AEA's activities related to workforce quality and "high performance" work organization. She is founder and director of AEA's national flagship effort to develop voluntary skill standards for high technology industries. With funding from the U.S. Department of Labor, she has built a coalition of AEA member firms, educators, high tech workers and government officials to carry out this initiative. She staffs three major national AEA committees concerned with workforce skills and development and directs AEA's Electronics Education Foundation. In addition to her national role, she provides program and policy support to AEA education efforts at the local and state level. She has served on numerous advisory councils related to education and workforce issues, including the National Association of Manufacturers Workforce Policy Committee and has provided expert testimony on developing skill standards and other high performance work issues to various policy bodies, including the U.S. Senate and House of Representatives. Before joining AEA, Ms. Fields Tyler worked for NASA's Jet Propulsion Laboratory, where she was responsible for communications and policy strategy for the Galileo and Ulysses space exploration missions.

EXHIBITS

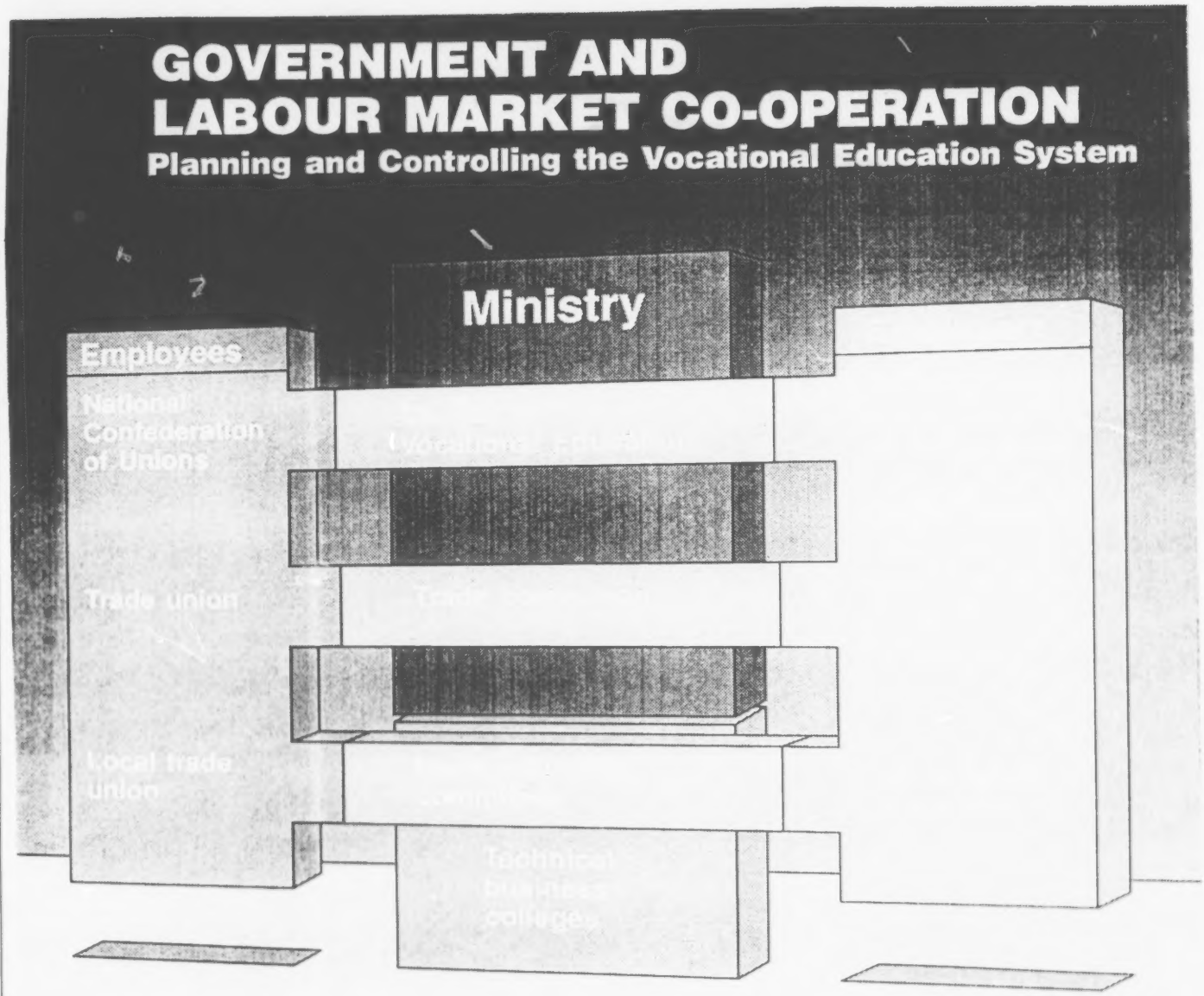

Exhibit 1 (Denmark)

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Exhibit 2, page 1 of 2 (Denmark)

Extracts from the Ministerial Order on the Vocational Education and Training Courses in the Field of Mechanical Engineering

School periods	2nd	3rd	4th	5th	6th
BASIC SUBJECTS - number of weeks		10	3.3	2.2	1
Trade knowledge and technological development	*	*			
Workshop techniques, 60 lessons	*	*	*	*	
Knowledge of materials	*	*	*		
Natural Sciences	*	*			
Foreign language (B), English	*	*			
Danish, 60 lessons		*			
First aid/fire fighting		*			
Mathematics		*			
Labour market relations	*	*	*		
Production and service	*	*	*	*	
Communication technology			*	*	*

School periods	2nd	3rd	4th	5th	6th
AREA SUBJECTS- number of weeks		6.3	4.7	1.5	22
Thermal joining	*	*			
Assembling and repair techniques	*	*			
Machining with and without shavings		*	*	*	
Control techniques		*	*	*	**
Measuring techniques	*	*			
Data techniques	*	*			

Exhibit 2, page 2 of 2 (Denmark)

The 2nd School Period

10. (1) It is the aim of the teaching in the 2nd school period

1) to provide the student with basic skills in turning, milling, hole making, grinding, measuring techniques, thermal and mechanical joining techniques, assembling and repair techniques, manual machining with/without shavings as well as control techniques,

2) to provide the student with knowledge about the theory of the trade which relates to the respective work disciplines,

3) to provide the student with knowledge about and skills in ordinary first aid,

4) to provide the student with knowledge about the trade and about the technological development, including production and service, as well as

5) to provide the student with knowledge about the social development of his time, including labour market relations.

(2) the teaching in the **area subjects** (part jobs) in the 2nd school period has the following objectives and other framework with regard to the contents:

1) **Thermal joining**

Thermal joining of construction parts. The work shall appear without any visible faults. The following work disciplines shall be included and the following requirements met:

a) Arc welding

The student shall be able to weld from the top down and choose electrodes according to welding disciplines and materials.

b) Inert gas welding

The student shall be able to weld together pipes and thin plate constructions.

c) Hard soldering

The student shall be able to carry out hard soldering in steel and copper materials.

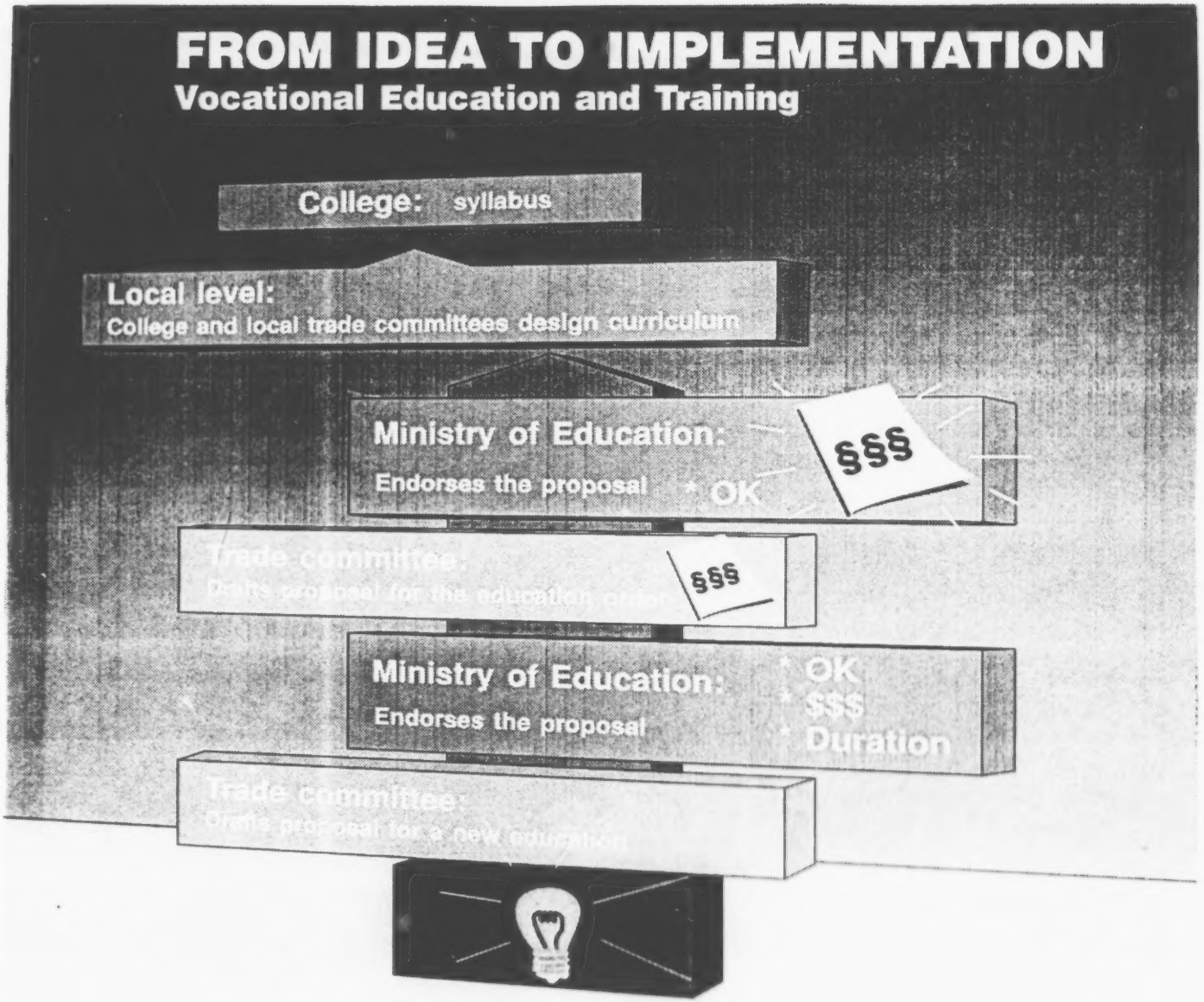

Exhibit 3 (Denmark)

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Exhibit 4 (Great Britain - NVQ)

Example 2: functional analysis from commercial horticulture

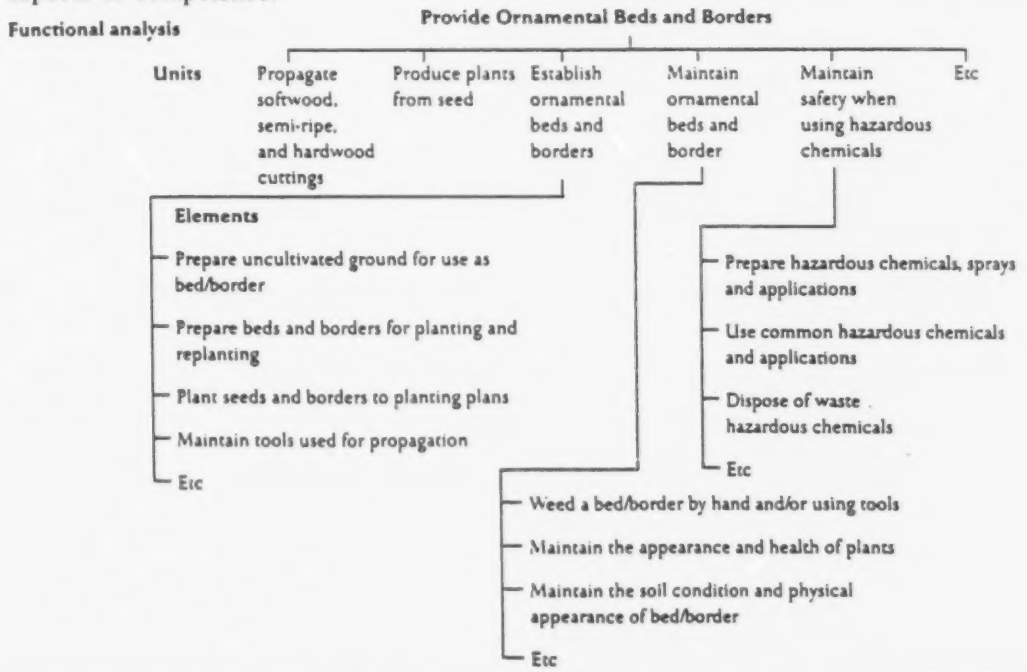
The advantages of functional analysis as a method of developing standards are illustrated in the following example from commercial horticulture.

The example illustrates how:

• Analysis of functions emphasises the objectives of the activity and so is more likely to include broader factors such as task management and contingency management. Task analysis can easily lead to the development of standards for separate tasks only.

• The systematic, top-down approach can clarify relationships between different functions, and can be used to ensure that different units and elements do not overlap.

The example shows a cohesive structure of units and elements derived by functional analysis for one key purpose of commercial horticulture "provide ornamental beds and borders". This is contrasted with a list of tasks and skills, written for the same area of work but using a bottom-up approach. There is also an illustration of how the job competence model might be used to incorporate the broader aspects of competence.


Functional analysis
Provide Ornamental Beds and Borders
Units
Propagate softwood, semi-ripe, and hardwood cuttings
Produce plants from seed
Establish ornamental beds and borders
Maintain ornamental beds and border
Maintain safety when using hazardous chemicals
Etc
Elements
Prepare uncultivated ground for use as bed/border
Prepare beds and borders for planting and replanting
Plant seeds and borders to planting plans
Maintain tools used for propagation
Etc
Prepare hazardous chemicals, sprays and applications
Use common hazardous chemicals and applications
Dispose of waste hazardous chemicals
Etc
Weed a bed/border by hand and/or using tools
Maintain the appearance and health of plants
Maintain the soil condition and physical appearance of bed/border
Etc

OCCUPATIONAL STANDARDS FOR THE CRAFT BAKING INDUSTRY

UNIT 3 PORTION, FORM AND SHAPE BAKERY PRODUCTS

ELEMENT 3.2 FORM AND SHAPE MIXTURES

Performance Criteria

3.2.1 Mixtures to be formed and shaped are of the elasticity, consistency and texture required by the specification and mixture type, and variances are acted upon appropriately

3.2.2 Mixtures are formed and shaped within production schedules using specified methods appropriate to the processes employed

3.2.3 Formed and shaped mixtures are maintained in conditions appropriate to the recipe specification

3.2.4 Formed and shaped mixtures meet the specification for dimension, contour and features appropriate to the product type and are passed to the appropriate person or location for the next stage in the bakery process

3.2.5 Waste is reclaimed or disposed of according to operational procedures

Range

Methods
Handing up/Chaffing
Docking
Pinning
Moulding
Cutting Out
Marking
Piping
Depositing
Laminating
Sheeting
Shaping Pastry or Confectionery Pastes

Procedures
Reclaiming and Disposing of Waste

Mixtures
Fermented Doughs
Powder Aerated Doughs
Batters
Cake Mixtures
Laminated Pastries

Health and Safety and Hygiene Requirements
Food Hygiene Regulations
Health and Safety at Work Regulations and Associated Legislation and Codes of Practice

Evidence Required

Performance Evidence will be required across a minimum of one fermented and one other mixture type, in relation to elasticity, consistency and texture as required by the production specification. Performance evidence will also be required for handing up or moulding, pinning, cutting out and piping across a minimum of one fermented dough and one other mixture. Evidence of appropriate waste reclamation for each method should also be sought. Evidence is required of the ability to meet production schedules and recipe specifications. Relevant Health, Safety and Hygiene Requirements must be met at all times.

Knowledge Evidence will be required across a range of mixtures that are significantly different in relation to characteristics of elasticity, consistency and texture. Knowledge relating to remaining methods across range. Principles relating to maintaining correct condition across range of mixtures will be required. In addition principles of reclamation and disposal across range of methods should also be sought. Knowledge of accessing specification and understanding of the importance of matching specification particularly in regard to thickness will also be required.

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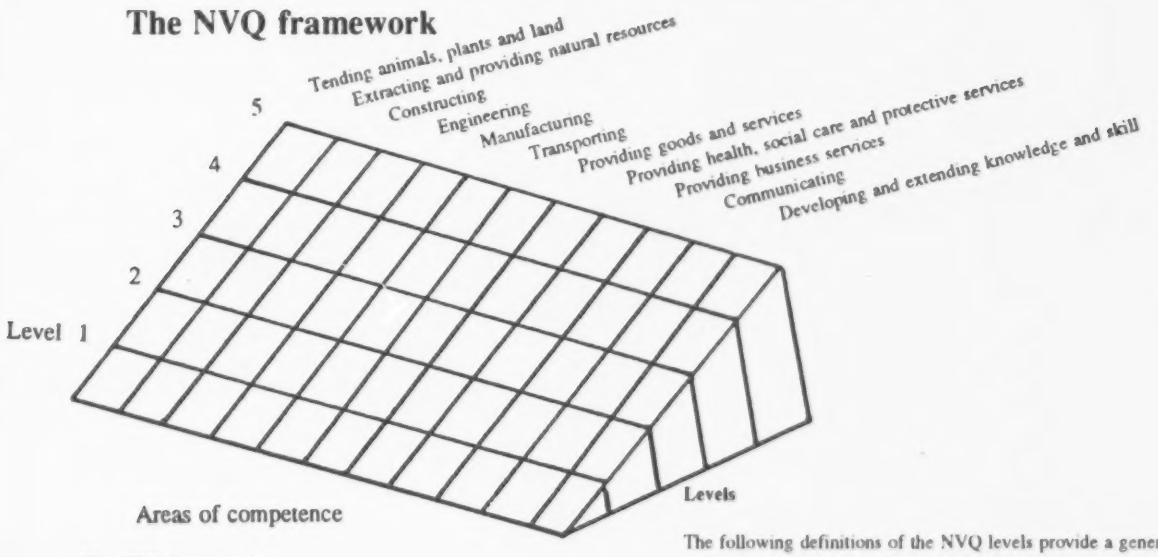
Exhibit 6 (Great Britain - NVQ)

The NVQ framework



The NVQ framework

Each NVQ is given a title and a level to place it in the NVQ framework. The NVQ framework shows how qualifications relate to each other and how people can progress through the system.

Areas of competence

The primary purposes of the NVQ framework are to create a coherent classification for qualifications and to facilitate transfer and progression, both within areas of competence and between them.

The main headings for the NVQ framework classification result from a functional analysis of work roles, and provide the initial organising structure for competence-based qualifications. Further refinements to the system are being made as the qualifications are developed and routes for progression/transfer are identified.

The following definitions of the NVQ levels provide a general guide and are not intended to be prescriptive.

Level 1: competence in the performance of a range of varied work activities, most of which may be routine and predictable.

Level 2: competence in a significant range of varied work activities, performed in a variety of contexts. Some of the activities are complex or non-routine, and there is some individual responsibility or autonomy. Collaboration with others, perhaps through membership of a work group or team, may often be a requirement.

Level 3: competence in a broad range of varied work activities performed in a wide variety of contexts and most of which are complex and non-routine. There is considerable responsibility and autonomy, and control or guidance of others is often required.

Level 4: competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources is often present.

Level 5: competence which involves the application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and for the allocation of substantial resources feature strongly, as do personal accountabilities for analysis and diagnosis, design, planning, execution and evaluation.

Exhibit 7 (Great Britain - GNVQ)

TIME TABLE FOR PHASING-IN GNVQs

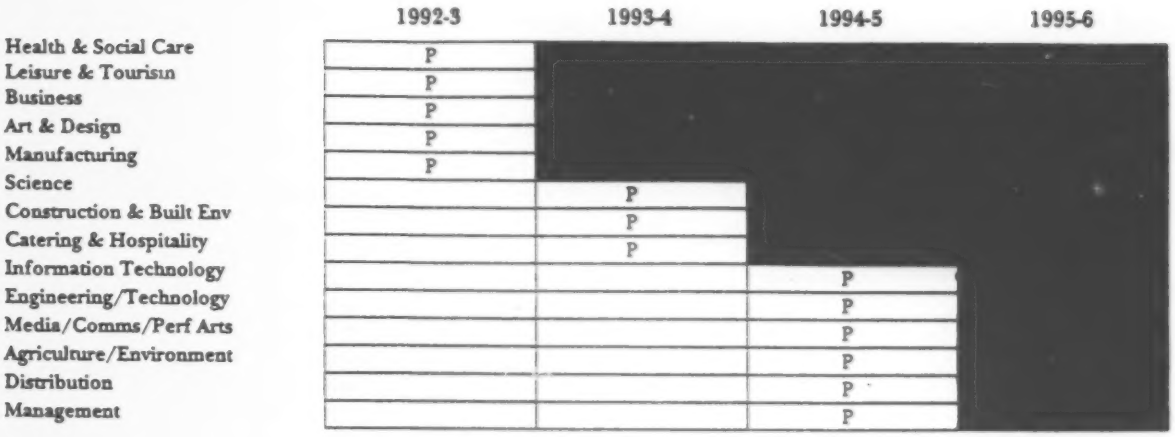


Exhibit 8, page 1 of 2 (Great Britain - GNVQ)

MANUFACTURING GNVQ - LEVEL 2 - SUMMARY OF UNITS AND ELEMENTS

2M1. PRODUCE AND APPLY STANDARD COMMUNICATION METHODS

1.1 Design a product from a given design brief
1.2 Apply standard communication methods

2M2. PRODUCTION PLAN

2.1 Investigate manufacturing systems
2.2 Produce production plans for products
2.3 Prepare production schedules

2M3. PROCESS OPERATIONS

3.1 Prepare materials/components and equipment/machinery
3.2 Operate material processing
3.3 Assemble materials/components to specification
3.4 Inspect manufactured products

2M4. QUALITY, SAFETY AND THE ENVIRONMENT

4.1 Apply quality assurance and control systems
4.2 Identify the health and safety requirements for the individual and the workplace
4.3 Identify the environmental effects of production processes

Exhibit 8, page 2 of 2 (Great Britain - GNVQ)

UNIT* 2M1 PRODUCE AND APPLY STANDARD COMMUNICATION METHODS

Element 1.1: Design a product from a given design brief

Performance criteria:

1 key design features are identified from a given design brief and accurately summarised
2 production process constraints are identified from a given brief and accurately summarised
3 relevant design and production constraints are identified and a specification is produced
4 potential proposals are generated to meet the specification
5 given evaluation criteria are used to select the final design proposal
6 sufficient technical information is obtained to allow the key stages of production to be identified
7 order and key stages of production are outlined

Range:

Key design features: aesthetic; contextual; functional; performance; production parameters (eg. cost; quantity; time)

Production constraints: labour (eg skill, personnel); available materials; available technologies; quality; health and safety (ie limiting/enabling features of production processes that will have a major impact on the specification)

Evaluation criteria relating to: key design features (eg. aesthetic; contextual; functional; performance; production parameters); production constraints (eg. labour; available materials; available technologies; quality; health and safety)

Technical information relating to available: materials/components; equipment/machinery; cost; quantity; time

Key stages of production: pre-production; production; post production

---

Evidence Indicator:

Product design proposals for the manufacture of two products using contrasting materials and scales of production. Evidence of participation in constructive interactions which clarify and interpret the brief, establish a specification, generate alternative design proposals, and leading to a final evaluated proposal, detailing order and key stages of production. In addition the candidate should demonstrate an understanding of the implications of the range dimensions and key principles in respect of them. The unit test will confirm the candidates coverage of range.

March 1993

Exhibit 9 (Scotland)

1.1 MODULE DESCRIPTORS

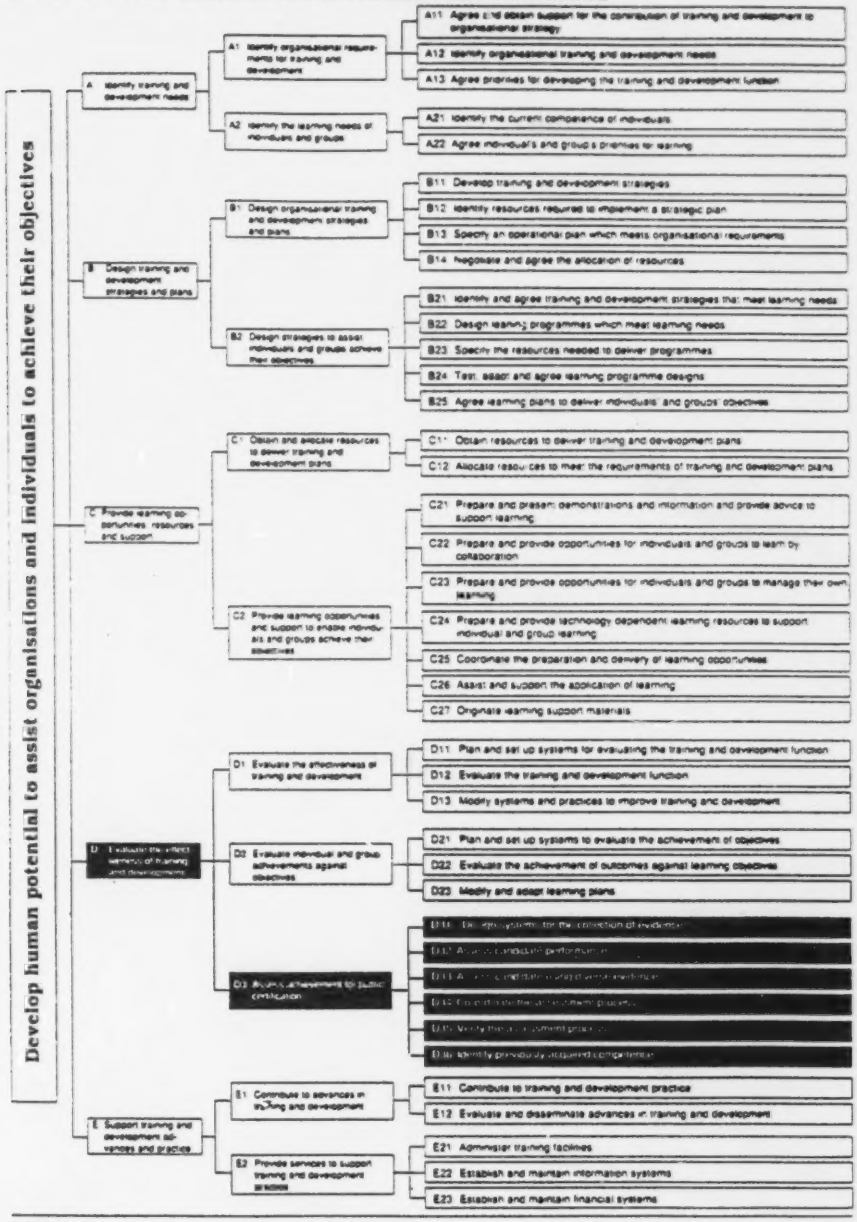
Modules are the basic units on which the National Certificate is operated. Each descriptor provides all the necessary information for teachers and lecturers to devise a programme of learning which will meet students' vocational, educational and personal needs and lead to the accreditation of their individual achievement.

Table 1.1 Components of a Module Descriptor

REFERENCE NUMBER and DATE	This ensures that the correct module descriptor is being used.
TITLE	This gives a clear idea of what the module is about. It is the module title which appears on the student's certificate.
PURPOSE	This gives a clear guide to the general changes in the learner which are to be brought about. An explanation is given of the uses for which the module was designed and the ways in which it can best be used in an educational or training programme. The target group for the module is also specified here.
PREFERRED ENTRY LEVEL	This shows the level of previous achievement or experience without which it is likely that a student will have difficulty in successfully completing the module.
LEARNING OUTCOMES AND PERFORMANCE CRITERIA	These specify clearly the key competences which are to be accredited and to describe how satisfactory performance can be recognised.
CONTENT/CONTEXT	These give an indication to tutors of the range of contexts within which a module could be offered and the subject matter which would assist in the achievement of the Learning Outcomes.
LEARNING AND TEACHING APPROACHES	These suggest learning strategies which enable the Learning Outcomes to be achieved in as student-centred, participative and practical a way as possible.
ASSESSMENT PROCEDURES	These indicate the most appropriate way in which the Learning Outcomes can be assessed and give a description of the level of performance which must be reached if the Performance Criteria are to be met.

Exhibit 10, page 1 of 3 (Great Britain)

2. The National Standards for Assessment and Verification


Develop human potential to assist organisations and individuals to achieve their objectives
A Identify training and development needs
A1 Identify organisational requirements for training and development
A11 Agree and obtain support for the contribution of training and development to organisational strategy
A12 Identify organisational training and development needs
A13 Agree priorities for developing the training and development function
A2 Identify the learning needs of individuals and groups
A21 Identify the current competence of individuals
A22 Agree individual's and group's priorities for learning
B Design training and development strategies and plans
B1 Design organisational training and development strategies and plans
B11 Develop training and development strategies
B12 Identify resources required to implement a strategic plan
B13 Specify an operational plan which meets organisational requirements
B14 Negotiate and agree the allocation of resources
B2 Design strategies to assist individuals and groups achieve their objectives
B21 Identify and agree training and development strategies that meet learning needs
B22 Design learning programmes which meet learning needs
B23 Specify the resources needed to deliver programmes
B24 Test, assess and agree learning programme designs
B25 Agree learning plans to deliver individuals' and groups' objectives
C Provide learning opportunities, resources and support
C1 Obtain and allocate resources to deliver training and development plans
C11 Obtain resources to deliver training and development plans
C12 Allocate resources to meet the requirements of training and development plans
C2 Provide learning opportunities and support to enable individuals and groups achieve their objectives
C21 Prepare and present demonstrations and information and provide advice to support learning
C22 Prepare and provide opportunities for individuals and groups to learn by collaboration
C23 Prepare and provide opportunities for individuals and groups to manage their own learning
C24 Prepare and provide technology dependent learning resources to support individual and group learning
C25 Coordinate the preparation and delivery of learning opportunities
C26 Assist and support the application of learning
C27 Originate learning support materials
D Evaluate the effectiveness of training and development
D1 Evaluate the effectiveness of training and development
D11 Plan and set up systems for evaluating the training and development function
D12 Evaluate the training and development function
D13 Modify systems and practices to improve training and development
D2 Evaluate individual and group achievements against objectives
D21 Plan and set up systems to evaluate the achievement of objectives
D22 Evaluate the achievement of outcomes against learning objectives
D23 Modify and adapt learning plans
D3 Assess achievement for public certification
D31 Design systems for the collection of evidence
D32 Assess candidate performance
D33 Advise candidates on appropriate programmes of learning
D34 Confirm candidates' achievements
D35 Verify assessment practices
D36 Identify previously acquired competences
E Support training and development advances and practice
E1 Contribute to advances in training and development
E11 Contribute to training and development practice
E12 Evaluate and disseminate advances in training and development
E2 Provide services to support training and development activities
E21 Administer training facilities
E22 Establish and maintain information systems
E23 Establish and maintain financial systems

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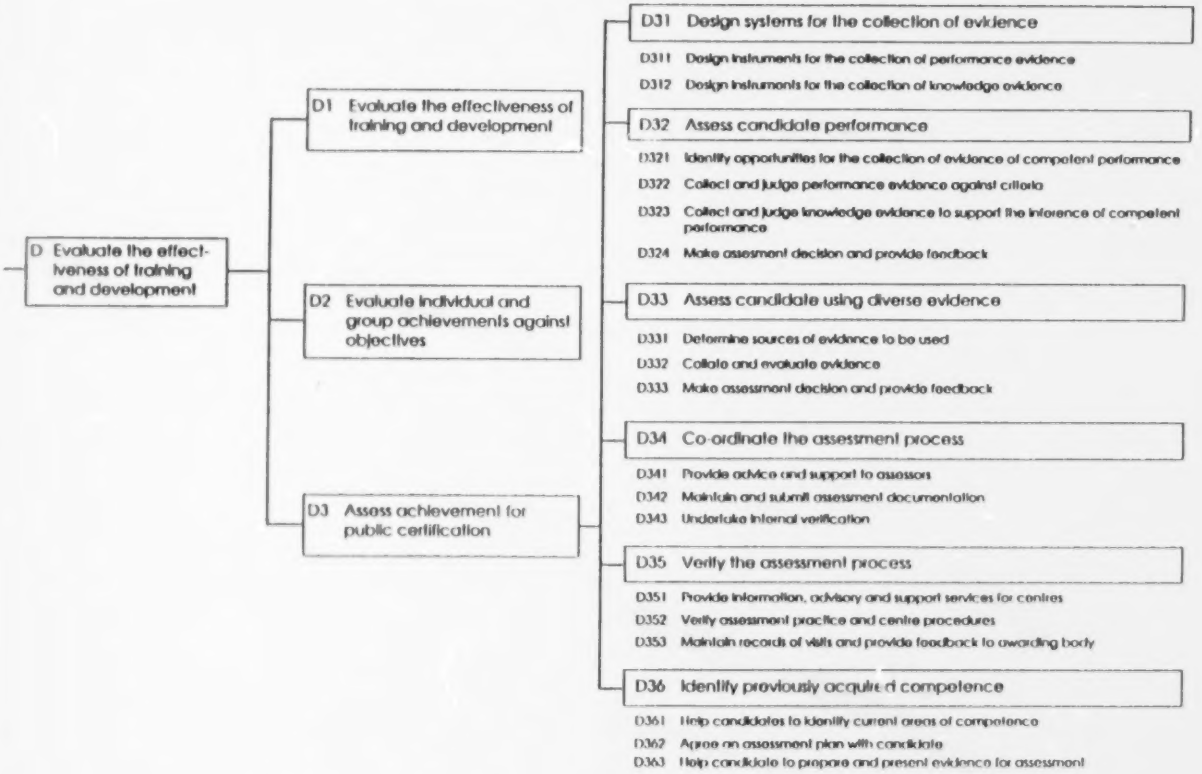
The National Standards for Assessment and Verification


D Evaluate the effectiveness of training and development
D1 Evaluate the effectiveness of training and development
D2 Evaluate individual and group achievements against objectives
D3 Assess achievement for public certification
D31 Design systems for the collection of evidence
D311 Design instruments for the collection of performance evidence
D312 Design instruments for the collection of knowledge evidence
D32 Assess candidate performance
D321 Identify opportunities for the collection of evidence of competent performance
D322 Collect and judge performance evidence against criteria
D323 Collect and judge knowledge evidence to support the inference of competent performance
D324 Make assesment decision and provide feedback
D33 Assess candidate using diverse evidence
D331 Determine sources of evidence to be used
D332 Collate and evaluate evidence
D333 Make assessment decision and provide feedback
D34 Co-ordinate the assessment process
D341 Provide advice and support to assessors
D342 Maintain and submit assessment documentation
D343 Undertake internal verification
D35 Verify the assessment process
D351 Provide information, advisory and support services for centres
D352 Verify assessment practice and centre procedures
D353 Maintain records of visits and provide feedback to awarding body
D36 Identify previously acquired competence
D361 Help candidates to identify current areas of competence
D362 Agree an assessment plan with candidate
D363 Help candidate to prepare and present evidence for assessment

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D31 DESIGN ASSESSMENT SYSTEMS

Elements D311 and D312 are unaltered from the January publication, and are subject to further consultation and development. They do not have 'Unit' recognition in the context of qualifications.

D311 Design instruments for the collection of performance evidence

a the instrument and its components have a clear and accurate relationship with the element, performance criteria and range which is to be assessed

b guidance and instructional material is clear and accurate

c the operational requirements of the instrument are consistent with the evidence specification and the procedures of the awarding body

d the instrument is capable of collecting valid and reliable evidence when used by a competent assessor

e simulations and skill tests are sufficiently realistic to provide valid assessment evidence

f the instrument is applicable to all potential candidates and suitable alternative operational procedures are made available for candidates with special needs which are outside the scope of the assessment

Range Indicators

Methods:	natural observation; simulations and skill tests
Operational requirements:	number of observations, location, allowable variances
Special needs:	disabled candidates, special learning needs

D312 Design instruments for the collection of knowledge evidence

a the instrument and its components identify knowledge domains which are clearly relevant to, and do not exceed, the element, performance criteria, range and underpinning knowledge which is to be assessed

b guidance and instructional material is clear and accurate

c the operational requirements of the instrument are consistent with the supplementary evidence specification and procedures of the awarding body

d the instrument is capable of collecting valid and reliable evidence when administered by a competent assessor

e items in fixed response written tests are expressed in unambiguous language and are sufficiently different from other items in the group to be able to accurately discriminate between correct and incorrect responses

f pre-set oral questions are clear, and expressed in the appropriate terminology of the occupation

g topics and themes for open/probing questions are accompanied by clear and valid guidance on the interpretation of responses and the questioning process

h the instrument is applicable to all potential candidates and suitable alternative operational procedures are made available for candidate with special needs which are outside the scope of the assessment

Range Indicators

Methods:	fixed response written tests, pre set oral tests, open response oral tests
Operational requirements:	marking system, allowable variances
Special needs:	hearing impaired candidates, sight impaired candidates, physically disabled candidates, special learning needs

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Exhibit 11 (Great Britain)

The Targets

Foundation Learning

1. By 1997, 80% of young people to reach NVQ2 (or equivalent).
2. Training and education to NVQ3 (or equivalent) to be available to all young people who can benefit.
3. By 2000, 50% of young people to reach NVQ3 (or equivalent).
4. Education and training provision to develop self-reliance, flexibility and breadth.

Lifetime Learning

1. By 1996, all employees should take part in training or development activities.
2. By 1996, 50% of the work-force to be aiming for NVQs or units towards them.
3. By 2000, 50% of the work-force to be qualified to at least NVQ3 (or equivalent).
4. By 1996, 50% of medium to larger organisations (200 or more employees) to be "Investors in People".

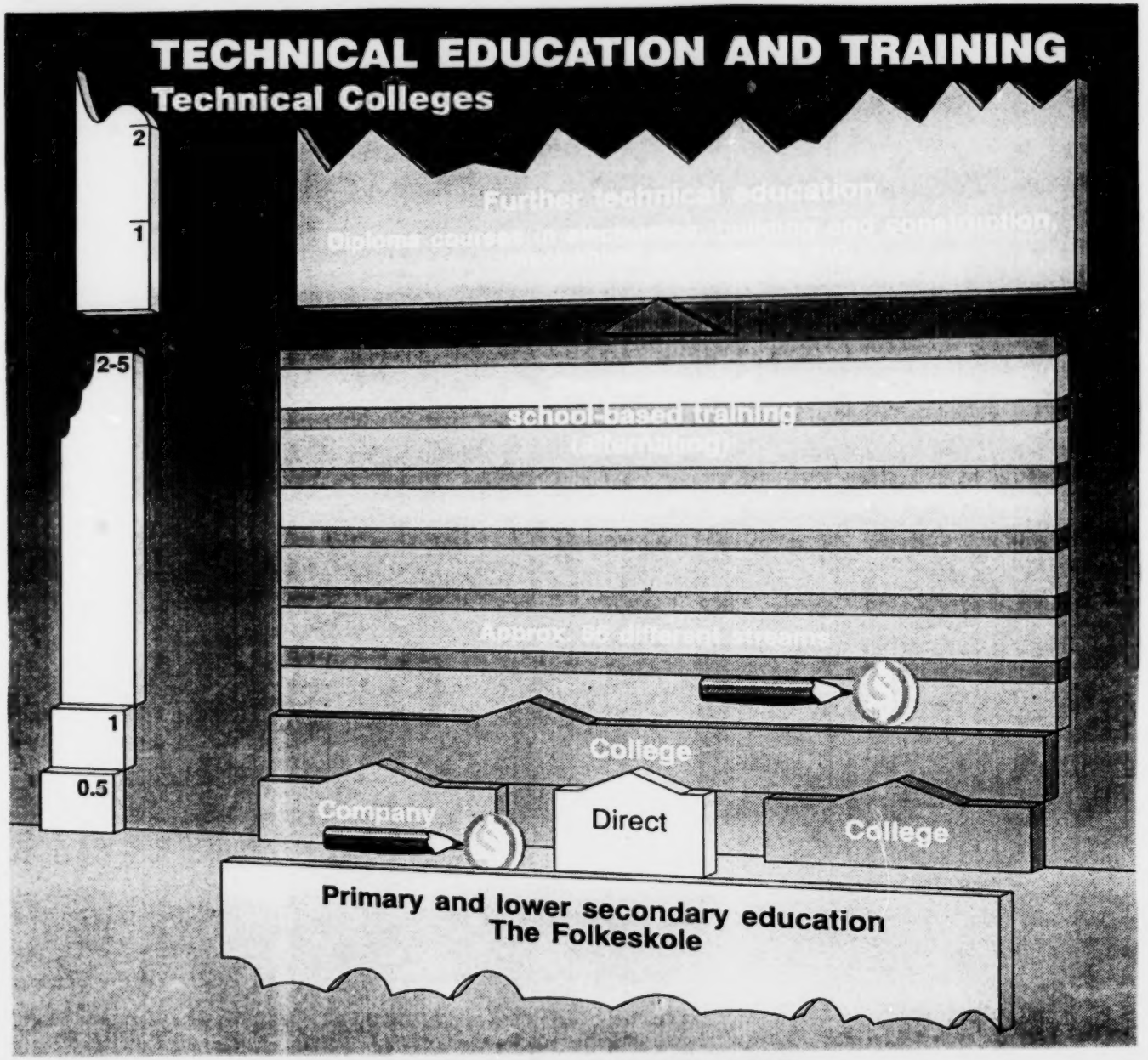

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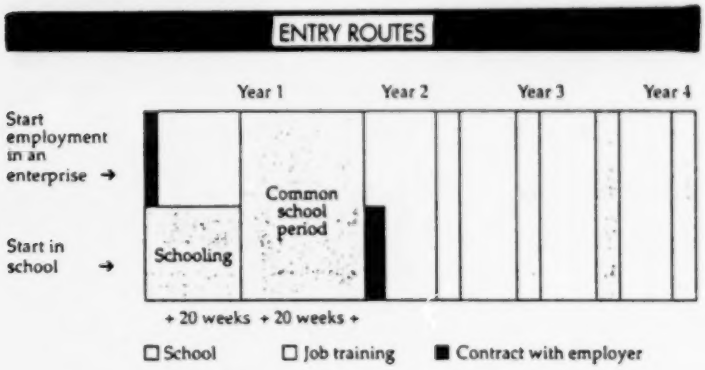
Exhibit 12, page 2 of 3 (Denmark)

Combined education and training with two routes of entry

Apprenticeships and efg have been replaced by a combined type of education and training with two entry routes. Trainees can begin employment in an enterprise, or start a 20-week introductory period (first term) at a commercial or technical school. This is followed by a 20-week period (second term), and teaching alternates subsequently between practical work and school instruction. The two routes are of equal value, and the education and training provided is identical after the first 20 weeks.



An entire type of education and training can last up to five years, alternating between practical work and schooling, and with a maximum of 80 weeks of schooling. Most of the types, however, have a duration of 3 or 4 years. The roughly 300 types of training which the former system covered have now been combined to achieve a smaller number – p.t. 86 – with broad access, and late specialisation. There is free access and free choice of schools.

Education : Fitter's
1 år
2 år
3 år
4 år
20
20
Trainee
10
5
10
5
10
10
10
10
10
10
10
10
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10
10
5
10
5
10
5
10
10
10
10
Fitter
Plastic mechanic
Ship fitter
Turner
Miller
Bench worker
Tool maker
Blocking / Cutting
Tool maker
mould maker
Cooling fitter
Precission
mechanic

(c) [illegible]

Exhibit 13 (Denmark)

Skills Needed by the Metalworker of the 1990's

* COMPREHENSION OF THE ELEMENTS, TERMINOLOGIES AND CONCEPTS OF PRODUCTION

* CONTROL OF OWN WORK, INCLUDING PLANNING DISCIPLINES

* COMPREHENSION OF PROPERTIES AND APPLICATION OF PRODUCTS

* NEW TECHNOLOGY, NEW MATERIALS AND THE APPLICATION AND IMPLICATIONS OF NEW METHODS

* INCREASED CO-OPERATION

* PARTICIPATION IN DEVELOPMENT AND READJUSTMENT PROJECTS

* KNOWLEDGE REQUIRED OF ADMINISTRATIVE SYSTEMS

* LINGUISTIC REQUIREMENTS

* EDB SKILLS AND COMPREHENSION REQUIRED

* DRAWING COMPREHENSION

* MEASURING TECHNIQUES

* INFORMATION HANDLING REQUIREMENTS

* COMPREHENSION OF OVERALL CONNECTIONS BETWEEN PRODUCTION AND COMPANY

Source: Danish Metalworkers' Union

Exhibit 14 (Great Britain - GNVQ)

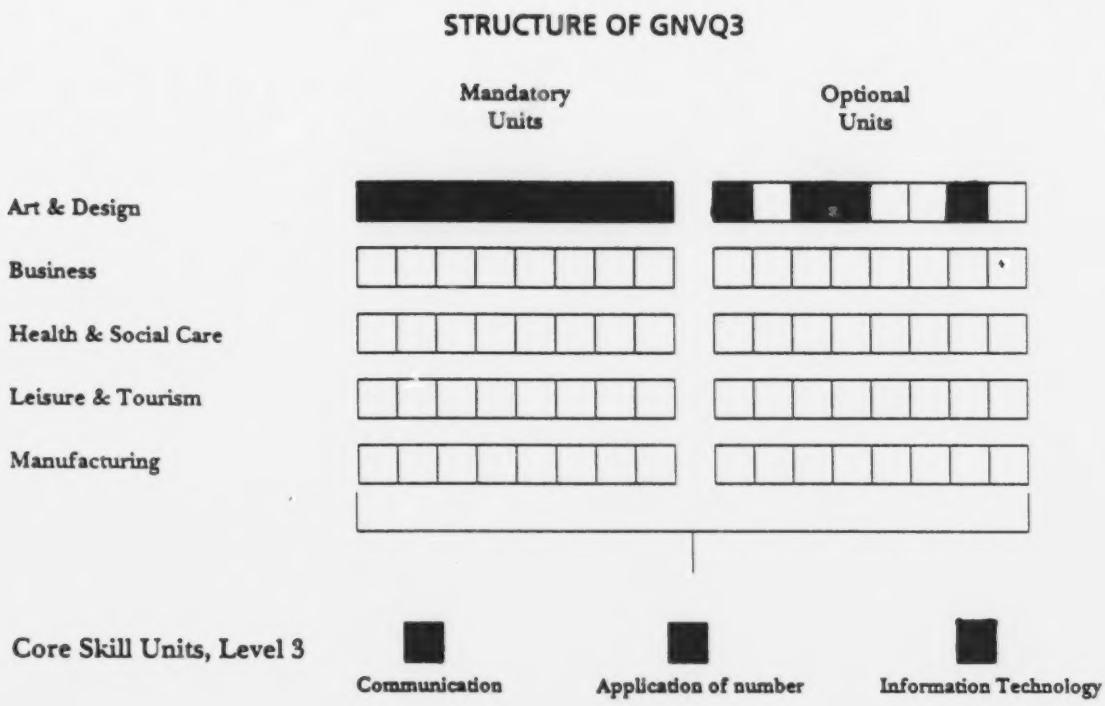


Exhibit 15, page 1 of 3 (Great Britain - GNVQ)

DEVELOPING AND PILOTING THE NCVQ CORE SKILL UNITS

Element list for Communication

Communication level 1

1.1 Take part in discussions with know individuals on routine matters
1.2 Prepare written materials in pre-set formats
1.3 Use images to illustrate points made in writing and in discussions with known individuals on routine matters
1.4 Read and respond to written material and images in pre-set formats

Communication level 2

2.1 Take part in discussions with a range of people on routine matters
2.2 Prepare written material on routine matters
2.3 Use images to illustrate points made in writing and in discussions with a range of people on routine matters
2.4 Read and respond to written material and images on routine matters

Communication level 3

3.1 Take part in discussions with a range of people on a range of matters
3.2 Prepare written material on a range of matters
3.3 Use images to illustrate points made in writing and in discussions with a range of people on a range of matters
3.4 Read and respond to written material and images on a range of matters

Communication level 4

4.1 Take part in, and evaluate the effectiveness of, discussions with a range of people on a range of matters
4.2 Prepare, and evaluate the effectiveness of, own written material on a range of matters
4.3 Use and evaluate the effectiveness of own use of images to illustrate points made in writing and in discussions with a range of people on a range of matters
4.4 Read and respond to written material and images and recognising the factors which influence own interpretation

Communication level 5

5.1 Lead, and evaluate the effectiveness of, discussions with a range of people on a range of matters
5.2 Prepare, and evaluate the effectiveness of, own and others' written material on a range of matters
5.3 Use and evaluate the effectiveness of own and others' use of images to illustrate points made in writing and in discussions with a range of people on a range of matters
5.4 Read, and respond to written material and images recognising the factors which influence own and others' interpretations

Exhibit 15, page 2 of 3 (Great Britain - GNVQ)

REPORT NO 16

Element list for Application of number

Application of number level 1

1.1 Gather and process data using group 1 mathematical techniques
1.2 Represent and tackle problems using group 1 mathematical techniques
1.3 Interpret and present mathematical data using group 1 mathematical techniques

Application of number level 2

2.1 Gather and process data using group 1 & 2 mathematical techniques
2.2 Represent and tackle problems using group 1 & 2 mathematical techniques
2.3 Interpret and present mathematical data using group 1 & 2 mathematical techniques

Application of number level 3

3.1 Gather and process data using group 1, 2 & 3 mathematical techniques
3.2 Represent and tackle problems using group 1, 2 & 3 mathematical techniques
3.3 Interpret and present mathematical data using group 1, 2 & 3 mathematical techniques

Application of number level 4

4.1 Gather and process data using group 1, 2, 3 & 4 mathematical techniques
4.2 Represent and tackle problems using group 1, 2, 3 & 4 mathematical techniques
4.3 Interpret and present mathematical data using group 1, 2, 3 & 4 mathematical techniques

Application of number level 5

5.1 Gather and process data using group 1, 2, 3, 4 & 5 mathematical techniques
5.2 Represent and tackle problems using group 1, 2, 3, 4 & 5 mathematical techniques
5.3 Interpret and present mathematical data using group 1, 2, 3, 4 & 5 mathematical techniques

Exhibit 15, page 3 of 3 (Great Britain - GNVQ)

DEVELOPING AND PILOTING THE NCVQ CORE SKILL UNIT

Element list for Information technology

Information technology level 1

1.1 Input data into specified locations
1.2 Edit and organise information within individual applications
1.3 Present information in pre-set formats
1.4 Use operating routines which maximise efficiency

Information technology level 2

2.1 Set-up, use, and input data into storage systems
2.2 Edit, organise and integrate information from different sources
2.3 Select and use formats for presenting information
2.4 Identify and use operating routines which maximise efficiency

Information technology level 3

3.1 Set system options and set up, use, and input data into storage systems
3.2 Edit, organise and integrate complex information from different sources
3.3 Select and use formats for presenting complex information from different sources
3.4 Select and use applications when they are an effective way of working with information

Information technology level 4

4.1 Set system options, set up and use storage systems, and prepare and input data
4.2 Set up and use automated routines to edit, organise and integrate complex information from different sources
4.3 Set up and use automated routines to format and present complex information from different sources
4.4 Evaluate and select applications for use by self

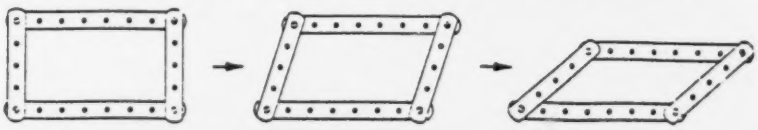
Information technology level 5

5.1 Set system options, set up and use storage systems, and validate, prepare and input data
5.2 Investigate and resolve problems in editing, organising and integrating complex information from different sources
5.3 Investigate and resolve problems in formatting and presenting complex information from different sources
5.4 Evaluate and select applications for use by self and others

Exhibit 16, page 1 of 3 (Denmark)

Igennem årtusinder har bygmestre og håndværkere fået og videregivet erfaringer om bestemte konstruktioners *stabilitet*.

Hvis man bygger en konstruktion som vist på tegningerne, er den ustabil:

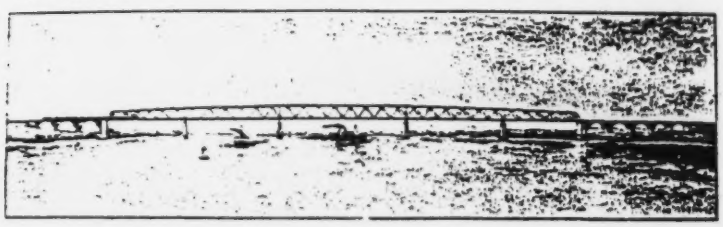


Det svarer helt til den viden, vi har: en firkant, hvis sidelængder er konstante, kan have forskellige former.

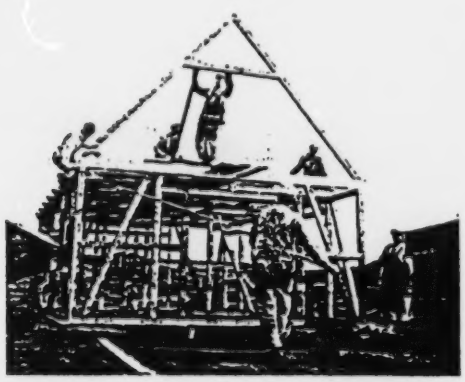
Bygger man derimod følgende konstruktion, er den stabil:

Fra geometrien ved vi, at trekanter med samme sidelængde har samme form. Det er altså ikke helt tilfældigt, når de optræder i mange konstruktioner.

Lillebæltsbroen som den udføres efter Statsbanernes Projekt af Firmaerne Monberg og Thorsen, Grün og Bilfinger, Krupp og Eilers, samt Aalborg nye Maskinfabrik.



Totallængde 1175 m. Længde af Hovedbroen over Vandet 825 m. Spændvidde af Midterbanegen 220 m. Fri Gennemsejlingshøjde under Broen 33 m. Vanddybde paa Strømpillernes Plads ca. 30 m.
Broen skal overføre to Jernbanespor, en ca. 6 m bred Kørebane og et ca. 2,25 m bredt Fortov.



Illustrationerne nederst side 208 er gengivet efter »Hverdagskunst – verdenskunst« af Broby Johansen. Forlaget Fremad 1942 og efter »Dansk stilhistorie« af H. H. Engqvist. Thanning og Appel 1962.

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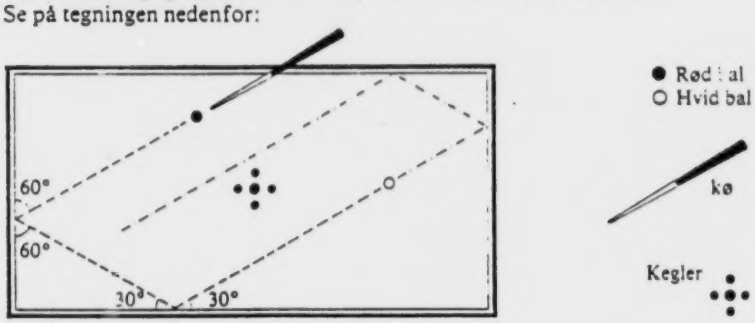
Viden om geometri bruges også i det mere fornøjelige, f.eks. bruger man viden om vinkler, når man spiller **billard**. Spillet billard (eller: kegle-billard) er en sportsgren – Dansk Billard Union er optaget under Dansk Idræts Forbund, og der afholdes både danske og europæiske mesterskaber.

Kort fortalt går spillet ud på, at man med en **kø** støder til en **rød bal** (kugle), som så skal ramme en hvid bal – som så igen skal ramme keglerne, den anden hvide bal eller gå i hul.
Det er altså vigtigt, at man kan beregne bal'ernes baner på forhånd.
Se på tegningen nedenfor:



Den stiplede linie viser den røde bal's bane, hvis den bliver ramt præcist på midten.

Hver af de to gange, den røde bal rammer **banden** (kanten omkring bordet) kan man se, at vinklerne er lige store.

Ved at få bal'erne til at **skrue**, kan man ændre vinklerne – og så kræves der en ret stor geometrisk og fysisk erfaring for at kunne beregne bal'ernes **baner**.

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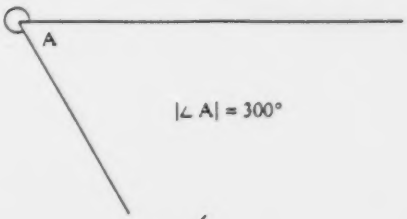
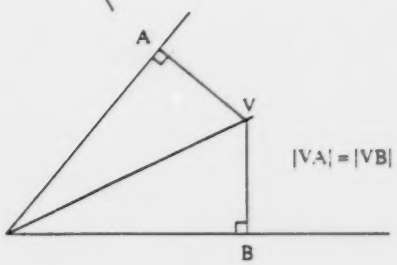
En vinkel kan være:

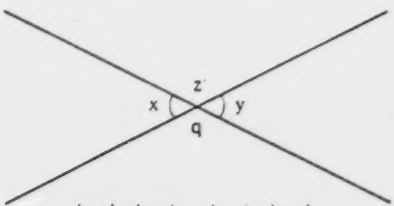
men den kan også være større end 180°:



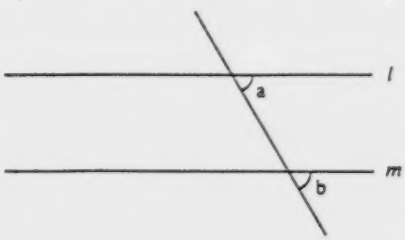
Et punkt på en *vinkelhalveringslinie* har samme afstand til vinklens ben.

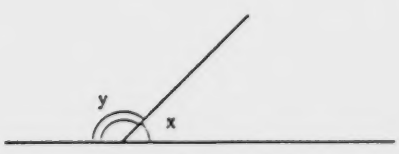


Topvinkler er lige store.



Ensliggende vinkler ved parallelle linier er lige store.
$|\angle a| = |\angle b|$ når og kun når $l \parallel m$.





Nabovinkler er tilsammen 180°.

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Exhibit 17 (Denmark)

=R= Table for the dept's evaluation of apprentice with a view to an eventual extra effort on weak points 1992.01.13

A245 3. sal side 1 KDT

Participants: _____

Distribution: Apprentice/Dept/xxx/xxx

Comments in general concerning social behaviour, disciplin

_____

_____

_____

MT = Very good T = Good IT = Not good

	Trainee period			Theoretical period		
Tasks	MT	T	IT	MT	T	IT

Points requiring follow-up

_____

_____

Sign. Afd.L / VF _____ d. _____

Exhibit 18 (Denmark)

=R=

A202-245

Evaluation after school - level
period _____-_____

side 1
KDT

Distribution: Apprentice/xxx/xxx

Name _____

Date _____

1 Set of marks from school period. See enclosure.

_____

2 Did the school period meet with your expectations
(tasks/quality)

_____

_____

_____

3 Are you confident that you achieved the optimum result of the teaching, if not at which stage do you think it slipped/you did not understand

_____

_____

_____ _____

_____

4 Has the practical part of the teaching been as expected, if not, wher do you think it went wrong (did not work out very well)

_____

_____

_____

5 Sign:_____d._____

_____

... 1992.02.24

Exhibit 19 (Great Britain - NVQ)

GUIDE TO NATIONAL VOCATIONAL QUALIFICATIONS

NVQ Assessment model

Elements of competence
with
Performance criteria

determine form and amount of evidence to be collected

through a combination of the following methods

Performance evidence
from
- natural observation in the workplace
- extracted examples within the workplace
- simulations (competency tests, skills tests, proficiency tests, projects/assignments etc)

Supplementary evidence
from
- oral questioning
- open written answers (short, long, essays etc)
- multiple choice tests

Evidence from prior achievements

reports, designs, computer programs, certificates from other sources etc.

Exhibit 20 (Scotland)

LIST OF STANDARD INSTRUMENTS OF ASSESSMENT

THE ASSESSMENT OF PRACTICAL COMPETENCE

Practical Exercise
Simulation
Role Play
Aural/Oral
Project
Assignment
Case Study

Log Book
Personal Interview
Questionnaire

} SELF REPORT TECHNIQUES

THE ASSESSMENT OF COGNITIVE COMPETENCE

Project
Assignment
Case Study
Written Test

a) CONSTRUCTED RESPONSE
- Restricted Response
- Extended Response
- Structured Question

} FREE RESPONSE TESTS

- Short Answer
- Completion

b) SELECTED RESPONSE
- Multiple Choice
- Multiple Response
- Matching
- Grid Question
- Alternative Response
- Assertion/Reason

} OBJECTIVE TESTS

Exhibit 21, page 1 of 2 (Scotland)

SCOTTISH VOCATIONAL EDUCATION COUNCIL Form EV8b

EXTERNAL VERIFIER REPORT
HOLD ON CERTIFICATION

DO NOT SEND COPY TO CENTRE

1 VERIFIER NAME		NUMBER	
2 COGNATE GROUP NAME		NUMBER	
3 CENTRE NAME		NUMBER	
4 DATE OF VISIT			
5 MODULE/UNIT HELD		NUMBER	

6 REASONS FOR HOLD *(tick as appropriate)*

REASONS	*OUTCOMES*					
	1	2	3	4	5	6
Assessment Instruments Not Available						
Inappropriate Assessment Instrument						
Incorrect or Inappropriate Assessment Specification						
No/Insufficient Evidence of Candidate Performance						
Performance Criteria Not Met						
Inappropriate Judgement of Candidate Performance						
No Record of Candidate Achievement						
Internal Standardisation Arrangements Unsatisfactory						

7 COMMENTS

Exhibit 21, page 2 of 2 (Scotland)

8 CAN THE CENTRE RECTIFY THE PROBLEMS IDENTIFIED? YES NO
(tick √ as appropriate) If NO please give your reasons.

9 WHERE THE DIFFICULTIES CAN BE RESOLVED, WHAT ACTION HAVE YOU RECOMMENDED THAT THE CENTRE TAKES? *(please give precise details)*

CENTRE CONTACT _____

10 DATE BY WHICH THE CENTRE HAS AGREED TO HAVE THE PROBLEMS RESOLVED? _____

SIGNED _____ DATE _____

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